

Online Radicalization in Pakistan: A Critical Appraisal

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Abstract

Digital Media (DM) has changed the traditional ways of radicalization processes, providing violent extremists with new methods to spread their messages, attract new followers and mobilize members. This study develops a triangulated theoretical framework to examine how digital media promotes radicalization, based on the Psychological Theory of Radicalization, the Hypodermic Needle Theory, and Filter Bubbles. It identifies the most influential digital media platforms (X, YouTube, and Facebook), websites, and encrypted applications (WhatsApp and Telegram) that contribute to the formation of echo chambers and the promotion of dangerous extreme opinions. The analysis of cases involving individuals and groups demonstrates the connection between psychological vulnerabilities, algorithmic processes, and extremism in the context of radicalization. This paper reveals that if digital radicalization is not controlled, it can lead to increase in national security threats, social division, and economic challenges. By applying deductive qualitative reasoning, this paper analyzes the mechanisms of algorithms, echo chambers, and targeted propaganda. Lastly, the DMF-RVE framework adds new value to the existing conceptual lens to analyze academic and policy relationship debates between digital media and radicalization.

Keywords: Algorithms, Digital Media, Echo-chambers, Violent Extremism, Filter bubbles, Propaganda, Radicalization, Hypodermic Needle Theory

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1. Introduction

“A squirrel dying in front of your house may be more relevant to your interests right now than people dying in Africa.”

—Mark Zuckerberg, Facebook founder.¹

The Indian subcontinent has long struggled with significant socioeconomic and political challenges. This also includes widespread corruption, a fragile criminal justice system, high unemployment, and restrictions on free speech.² These factors have created fertile ground for the rise of radicalization, religious extremism, and terrorism in the region.³ After 9/11, President Bush declared, “Either you are with us or against us,” which marked a pivotal moment in history, prompting Pakistan to take a frontline position in the global fight against terrorism.⁴ This shift has profound repercussions for Pakistan as the war in Afghanistan spilled over its borders, transforming traditional forms of terrorism into modern, tech-savvy operations.⁵ Terrorists began leveraging the internet to propagate their ideologies, recruit members, secure funding, and provide virtual training.⁶ The aftershocks of the WOT have further exacerbated Pakistan's socio-economic issues including poverty,

¹ Eli Pariser, *The Filter Bubble: What the Internet is Hiding from You* (New York: Penguin Press HC, 2011), 9.

² Manam Hanafi, "Social Media as a Source of Radicalization: A Case Study of Pakistan," *Pakistan Journal of Terrorism Research* 4, no. 1 (January 2021): 2, <https://www.nacta.gov.pk/wp-content/uploads/2021/09/Manam-Hanfi.pdf>.

³ Hanafi, "Social Media as a Source of Radicalization," 2.

⁴ George W. Bush, "An Address to a Joint Session of Congress and the American People" (speech, Before Joint Session of Congress, US, September 20, 2001). (PDF) Address to a joint session of Congress and the American people | george bush - Academia.edu.

⁵ Abeera Haider, Saqib K. Warraich, and Alishba Mukhtar, "Use of Facebook and Twitter by Terrorist Organizations to Radicalize the Youth: A Case Study of TTP, BLA and ISIS in Pakistan," *Bulletin of Business and Economics* 12, no. 2 (January 2023): 172, doi:10.5281/zenodo.8314932.

⁶ Idris Mohammed et al., "Disinformation as a Tool for Recruitment by Terrorist Groups in Nigeria," *Konfrontasi: Jurnal Kultural, Ekonomi Dan Perubahan Sosial* 12, no. 1 (March 2025): 25, <https://doi.org/10.33258/konfrontasi2.v12i1.324>

economic instability, political unrest, and heightened sectarian tensions. These conditions have made the internet a convenient platform for disillusioned youth to express their frustrations and, in many cases, fall prey to extremist propaganda.⁷

Modern theories of cognition and emotion are now developing integrative frameworks to understand people's feelings and interests.⁸ Due to emerging technologies in communication, there is also a paradigm shift in psychological and human behavior theories.⁹ The intersection of technology and human behavior has become increasingly complex. Digital media has transformed how information is consumed and shared—with the emergence of echo chambers and algorithms. Public perception and behaviors now depend upon digital tools that individuals have in their hands. In Pakistan, these digital mechanisms have significantly impacted the landscape of radicalization.¹⁰ Social Media Networks (SMNs) and search engines employ sophisticated algorithms to personalize content by optimizing user engagement. This optimization is based on past interactions and information that aligns with individual preferences.¹¹ While these algorithms enhance users' experience, they also contribute to the formation of echo chambers—environments where users are primarily exposed to information that reinforces their existing beliefs.¹²

⁷ Amber Javed, Noor Elahi, and Bahadar Nawab, "Exploring the Dynamics of Radicalization in Pakistan: A Comprehensive Analysis," *SAGE Open* 15, no. 1 (March 2025): 2, <https://doi.org/10.1177/21582440251326872>.

⁸ Paul J. Silvia, *Exploring the Psychology of Interest* (New York: Oxford University Press, 2006), 2.

⁹ NeuroLaunch E. Team, "Paradigm Shift Psychology: Transforming Mental Models for Personal Growth," *NeuroLaunch*, last modified September 15, 2024, <https://neurolaunch.com/paradigm-shift-psychology/>.

¹⁰ Saif ur Rehman Tahir, "A Study of Tehreek-e-Taliban Pakistan (TTP) Social Media Communication: Major Trends, Key Themes and Propaganda Appeals," *Pakistan Journal of Terrorism Research* 2, no. 1 (February 2021): 2, <https://www.nacta.gov.pk/wp-content/uploads/2021/09/A-Study-of-TTP-Pakistan-Social-Media-Communication-1>.

¹¹ Tzu-Chien Wang, "Deep Learning-Based Prediction and Revenue Optimization for Online Platform User Journeys," *Quantitative Finance and Economics* 8, no. 1 (January 2024): 26, doi:10.3934/qfe.2024001.

¹² Eli Pariser, *The Filter Bubble: What the Internet is Hiding from You*, 22.

The law enforcement organization in the UK called 'The Crown Prosecution Service (CPS)' finds the diverse nature of extremist groups surrounding various political, ethnic, religious, and racial identities.¹³ After 9/11 it was evident that ISIS, Al-Qaeda, right-wing extremists, and other terrorist organizations were not only engaged in physical attacks but also leveraging online presence to pose a persistent and growing threat. This online presence facilitates these organizations by disseminating and normalizing irregular compartments. Neumann called it an echo chamber, where individuals are absorbed in an environment where like-minded ideological factors dominate and strengthen their beliefs.¹⁴

As a result, algorithmic decisions strengthen preexisting presumptions and consumption patterns, creating an ambiance whereby one spends most of their time with people who share similar opinions.¹⁵ The book "Filter Bubble" argues that these pre-determined algorithmic choices limit users from venturing into new information frontiers and unexplored ideas.¹⁶ The restrictions systematically deprive users of content beyond their political, religious, or ideological convictions. This contributes to the creation of echo-chambers, where individuals predominantly interact with like-minded people. An empirical study also points out that DM algorithms contribute to spreading extremist networks and discourses.¹⁷ Research identifies instances revealing that within the scope of YouTube, once extremist content is consumed by a user, algorithmic recommendations for additional extremist material are provided automatically.¹⁸

¹³ Victoria A. Correia and Moufida Sadok, "Governing online terrorist propaganda: a societal security issue," in *7th International Workshop on Socio-Technical Perspective in IS Development* (Italy: CEUR Workshop Proceedings, 2021), 232.

¹⁴ Peter R. Neumann, "Options and Strategies for Countering Online Radicalization in the United States," *START* 36, no. 6 (January 2013): 431, doi:10.1080/1057610x.2013.784568.

¹⁵ Adepu Srihita et al., "Private Artificial Intelligence (AI) in Social Media," in *Sustainable Development Using Private AI: Security Models and Applications* (Boca Raton: CRC Press, 2024), 151, <https://doi.org/10.1201/9781032716749>.

¹⁶ Pariser, *The Filter Bubble*, 14.

¹⁷ Alastair Reed et al., "Radical Filter Bubbles Social Media Personalisation Algorithms and Extremist Content," *Royal United Services Institute (RUSI)*, no. 8 (July 2019): 4, doi:20190726_grmtt_paper_08_0.

¹⁸ Reza Montasari, *Cyberspace, Cyberterrorism and the International Security in the Fourth Industrial Revolution: Threats, Assessment, and Responses* (Basingstoke: Springer Nature, 2024), 117, doi:10.1007/978-3-031-50454-9.

The influence of algorithms and echo chambers is pertinent and pronounced in Pakistan, where political polarization, religious tensions, and social divisions are exacerbated through digital platforms.¹⁹ The political influence of DM in Pakistan indicates how algorithms can manipulate public opinions. Online political slogans and hashtags used in election campaigns are classic examples of algorithmically generated content.²⁰ However, this raises ethical concerns over algorithmic roles within democratic processes and discourses. This research paper elucidates how algorithms work on SMNs and facilitate echo chambers, thus leading to filter bubble formation. It will also provide an in-depth knowledge about filter bubbles' basic functioning by examining case studies and technological advancements in DM. By analyzing factors and strategies employed by radical groups this paper will explain emerging trends within the context of Pakistan. This research is significant for Pakistan because these tools are used to spread radical ideologies and disintegrate the social fabric of Pakistan, using techniques such as content personalization, algorithmic bias, and digital isolation.²¹ These tools not only amplify divisive content but also facilitate the spread of misinformation, disinformation, and hate speech. Thus, it is important to explore both algorithms and echo chambers, in identifying how extremist individuals use DM for social networking and online recruiting.

The study focuses on the dual role of digital media: as a space for democratized participation and as a mechanism vulnerable to exploitation by extremists. It seeks to explore how algorithm-driven platforms like Facebook,

¹⁹ Usama Javed and Umer Javed, "The Influence of Social Media Algorithms on Political Polarization and Public Opinion," *Online Media and Society* 4, no. 2 (June 2023): 45, doi:10.71016/oms/2ffw9391.

²⁰ Dr. Muhammad Akbar and Dr. Aasima Safdar, "Exploring Ethnic Discrimination and Hate Speech in Online Political Discourses: A Comprehensive Analysis from the Pakistani Context," *Annals of Human and Social Sciences* 5, no. 1 (March 2024): 271, doi:10.35484/ahss.2024(5-i)25.

²¹ Warisha Rashid, "Using Artificial Intelligence to Combat Extremism," *Pakistan Journal of Terrorism Research* 4, no. 5 (February 2023): 10.

Twitter (X) and YouTube prioritize content, shape user exposure to political information, and facilitate the viral spread of ideologically homogeneous material. Through case reference terrorist organizations Zainbiyoun Brigade (ZB), Baloch Republican Army (BRA), Baloch Liberation Front (BLF), Tehreek-e-Taliban Pakistan (TTP), and Baloch Liberation Army (BLA), the paper analyzes how these actors leveraged echo-chambers to expand influence, mobilize support, and shape national narratives. By doing so, this study aims to critically examine the consequences of algorithmic personalization on public opinion, civic engagement, and extremism in Pakistan.

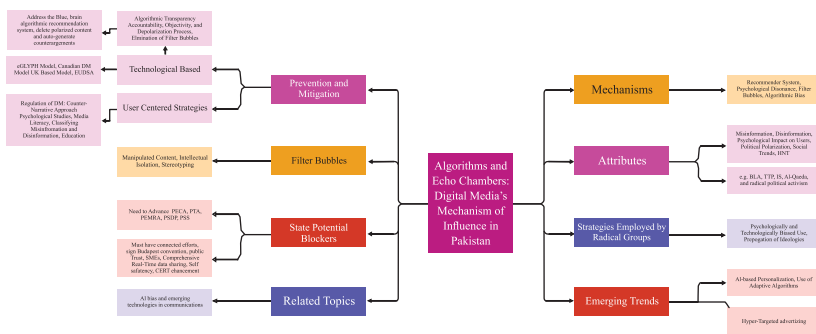


Figure 1: Mechanism and Impact of Algorithms and Echo Chambers in Pakistan's Digital Media Landscape—source: created by the author.

2. Introduction to Algorithms and Echo Chambers

Digital media algorithms are sophisticated systems designed to determine which content appears in a user's feed on platforms like FB, Instagram, TikTok, and X. These algorithms utilize a variety of rules and calculations to prioritize content based on user behavior, preferences, and interactions.²² Algorithms are

²² Usama Javed and Umer Javed, "The Influence of Social Media Algorithms on Political Polarization and Public Opinion," *Human Nature Research Publisher* 4, no. 2 (June 2023): 45, doi:10.1080/23808985.2021.1976070.

sets of rules and signals that rank content on SMNs according to how likely the user will engage with it. This means that users see different content based on their preferences even if they follow the same account.²³ However, the problem arises when algorithmic biases happen, causing radicalization.²⁴ These biases frequently reinforce existing political divides by favoring content aligned with users' preferences while limiting exposure to different viewpoints.²⁵

Thus, personalization through algorithms causes the formation of echo chambers. An echo chamber can be defined as an environment in which repeated exposure to the same peers with similar views, opinions, political leaning, or beliefs of an individual about a certain topic is reinforced.²⁶ At an intellectual level, the echo chamber phenomenon can be recognized in the context of Hypodermic Needle Theory (HNT) and the psychological radicalization theory. Human beings seek information that aligns with their pre-existing opinions, also called confirmation bias.²⁷ An increase in digital media consumption develops the phenomenon of a homophilic grouping of individuals. Consequently, it catalyzes an ecosystem surrounding the individual with people who share the same opinion as him: an echo chamber.²⁸ This dynamic has accelerated the spread of political misinformation, fueling disinformation and divisive debates. Echo chambers remain a major concern as they draw like-minded individuals and amplify similar content, creating a biased and restricted information landscape.²⁹

²³ Monika Verma, "Understanding Social Media Algorithms [2023 Complete Guide]," SocialPilot, last modified June 16, 2023, <https://www.socialpilot.co/blog/social-media-algorithm>.

²⁴ N. Javed and Javed, "The Influence of Social Media Algorithms," 46.

²⁵ Akbar and Safdar, "Exploring Ethnic Discrimination and Hate Speech in Online Political Discourses," 757.

²⁶ Matteo Cinelli et al., "Echo Chambers on Social Media: A comparative analysis," *arXiv* 2004, no. 09603 (April 2020): 1, <https://doi.org/10.48550/arXiv.2004.09603>.

²⁷ Raymond S. Nickerson, "Confirmation bias: A ubiquitous phenomenon in many guises," *Review of General Psychology* 2, no. 2 (May 1998): 176, doi:10.1037//1089-2680.2.2.175.

²⁸ Cinelli, "Echo Chambers on Social Media," 3.

²⁹ Mehr U. Nisa and Atif Ashraf, "Echo Chamber Effect of Fake Political News in Spreading Misinformation: A Study of Facebook Users in Pakistan with Moderating Role of Media Literacy," *Remittances Review* 9, no. 1 (March 2024): 137, doi: 10.33282/rr.vx9i2.10

2.1. Basic Functioning of Algorithms

Algorithms on platforms like Facebook, YouTube, and Twitter analyze user behavior (clicks, likes, shares) to personalize content.³⁰ This engagement-driven approach often promotes sensational and emotionally charged material, as it maximizes user interaction. In Pakistan, these algorithms push divisive content—such as sectarian debates, political propaganda, and extremist narratives—to users already inclined toward such topics, creating a reinforcing loop of radicalization.³¹ This dynamic is further intensified by confirmation bias, wherein individuals preferentially engage with information that affirms their preexisting beliefs. As a result, exposure to alternative perspectives diminishes, deepening ideological entrenchment. For example: Recommendation Algorithms (e.g., YouTube's autoplay) suggest content based on previous views, often leading vulnerable users toward increasingly extreme topics.³² Feed Algorithms (e.g., Facebook's news feed) prioritize posts with higher engagement, creating echo chambers where users only see content aligned with their beliefs.³³

Similarly, algorithms and echo chambers tend to inadvertently reinforce the process of radicalization and lead to extremism in the society. After the fall of Kabul, the reemergence of Taliban³⁴ led to a new era of terrorism and

³⁰ Anja Bechmann and Stine Lomborg, "Predictive Algorithms and Personalization Services on Social Network Sites," in *The Ubiquitous Internet: User and Industry Perspectives* (London: Routledge, 2014), 130.

³¹ Syed M. Zaidi, Saira N. Abbasi, and Muhammad U. Hayat, "Understanding the rise in violent extremism in Pakistan through the lens of securitization theory," *Asian Journal of Political Science* 32, no. 2 (October 2024): 4, doi:10.1080/02185377.2024.2417994.

³² Mert C. Cakmak, Nitin Agarwal, and Remi Oni, "The bias beneath: analyzing drift in YouTube's algorithmic recommendations," *Social Network Analysis and Mining* 14, no. 171 (August 2024): 1, doi:10.1007/s13278-024-01343-5.

³³ Brent Kitchens, Steve L. Johnson, and Peter Gray, "Understanding Echo Chambers and Filter Bubbles: The Impact of Social Media on Diversification and Partisan Shifts in News Consumption," *MIS Quarterly* 44, no. 4 (December 2020): 1620, doi:10.25300/misq/2020/16371.

³⁴ The term 'Taliban 2.0' refers to the re-emergence and rebranding of the Taliban in a more media-savvy and strategically adaptive form, particularly evident after their resurgence in Afghanistan post-2021. They embraced modern technologies and digital platforms to shape their image, disseminate propaganda, and control the narrative globally.

radicalization in Pakistan, mainly in far-flung areas near the Afghanistan border including KP and Balochistan.³⁵ Tehrik-e-Taliban Pakistan (TTP or also known as Fitna al Khawarij by Government of Pakistan) initiated misinformation campaigns on SMNs, using propaganda and ideological warfare to fuel radicalization. This targeted individuals that were already psychologically vulnerable to extremist ideals.³⁶ TTP started online campaigns in KP and South Punjab where there is already a high rate of illiteracy and underlying grievances. They started the process of radicalization by utilizing pamphlets, podcasts, and other information dissemination techniques. For example, the Counter-Terrorism Department (CTD) found that TTP has a media wing, Umer Media, where local facilitators having studios in Darra Adam Khel, Malakand, and Mohmand agency worked independently.³⁷ They also created a podcast channel called "Pasoon," in which TTP leaders explain their narrative to vulnerable youth in weekly broadcasts.³⁸ All this propaganda remains online on SM platforms, exploiting youth and users again and again as algorithms lead that youth into echo chambers where they remain exposed to such vile extremist propaganda.

2.2. Formation of Echo-Chambers in Pakistan

In social media, echo chambers form when users engage primarily with like-minded individuals or content. Algorithms exacerbate this by prioritizing similar content, creating a feedback loop reinforcing pre-existing beliefs and biases.³⁹ While social media platforms have democratized access to political

³⁵ Izaz Ullah and Imad Abbas, "Media Manipulation and Radicalization: Unravelling TTP Online Propaganda Ecosystem," in *Critical Issues Facing South Asia: Politics, Security and Non-Traditional Challenges* (Islamabad: ISSI, 2024), 31, <https://issi.org.pk/critical-issues-facing-south-asia-politics-security-and-non-traditional-challenges/>.

³⁶ Izaz and Abbas, "Media Manipulation and Radicalization," 33.

³⁷ Izaz and Abbas, "Media Manipulation and Radicalization," 40.

³⁸ TKD, "TKD Monitoring: TTP Podcast (Pasoon), Episode 30," TheKhorasanDiary, last modified November 19, 2023, <https://thekhorasandiary.com/en/2023/11/19/tkd-monitoring-ttp-podcast-pasoon-episode-30>.

³⁹ Faisal Alatawi et al., "A Survey on Echo Chambers on Social Media: Description, Detection and Mitigation," *arXiv* 2112, no. 5084 (December 2021): 6, <https://doi.org/10.48550/arXiv.2112.05084>.

discourse, they have also introduced significant challenges that threaten the integrity of democratic processes.⁴⁰ One of the most critical concerns is spreading false or misleading information to deceive or manipulate audiences. These disinformation campaigns rely on fake news, altered images, and sensational headlines circulated on social media to sway public opinion or discredit opponents.⁴¹ This phenomenon is particularly concerning in Pakistan, where:

- Sectarian or ideological groups thrive in closed online communities. For example, there was an increase in attacks when more posts circulated on SMNs against the Shia Community.⁴² The exploitation and killing of the Hazara community and the Kurram massacre on 22 November 2024, where the terrorists killed more than 60 Shiite Muslims, is a case in point.⁴³
- Radical groups exploit echo chambers to propagate extremist ideologies, leaving little room for counter/alternate narratives or critical debate.⁴⁴

Echo chambers limit exposure to diverse perspectives, fostering intolerance and, in some cases, facilitating the radicalization of individuals.

⁴⁰ Keyan Chen, "The Impact of Social Media on Democratic Politics in the Western Background," *Lecture Notes in Education Psychology and Public Media* 56, no. 1 (July 2024): 93, doi:10.54254/2753-7048/56/20241590.

⁴¹ Muhammad Ayaz et al., "The Impact of Technology on Pakistan's Political Discourse: Integrating Islamic Values," *Tanazur* 5, no. 3 (September 2024): 19, <https://tanazur.com.pk/index.php/tanazur/article/view/322/322>.

⁴² Shirin Jaafari, "Hazara community demands justice for slain coal miners in Pakistan," *The World*, January 18, 2021, <https://theworld.org/stories/2021/01/18/headline-activists-killing-coal-miners-pakistan-reminder-deliberate-targeting>.

⁴³ "US condemns Kurram attack," *Express Tribune*, November 23, 2024, <https://tribune.com.pk/story/2511332/us-condemns-kurram-attack>.

⁴⁴ Michele Sorice and Colletta Alessandro, "Far Right Extremism on Social Network: An analysis of the phenomenon," *Corso di laurea in Politics, Philosophy and Economics*, May 2023, 7, doi:10.13140/RG.2.2.14069.55529.

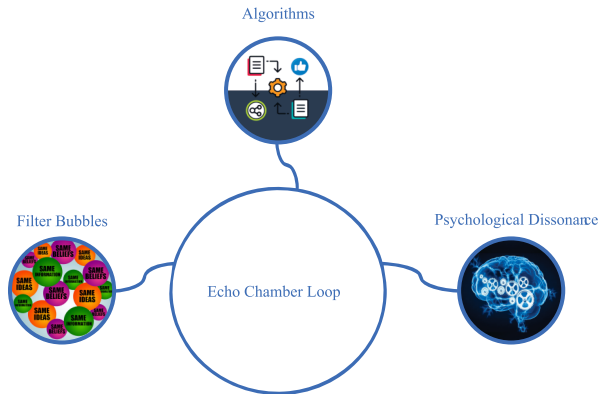


Figure 2: *Echo Chamber mechanism effect linked to 3 main factors: SMNs such as filter bubbles, auto-generated algorithms, and psychological dissonance. These correlated variables create an echo chamber loop that reinforces individual beliefs.*

2.3. Attributes of Echo Chambers

The 5 most common attributes of echo chambers include:⁴⁵

- Misinformation and Disinformation
- Formation of Social Trends
- Psychological Impact on Users
- Radicalization
- Spreading of Hypodermic Needle Theory

In an era of Web 2.0,⁴⁶ individuals are utilizing widely recognized social media platforms due to easy accessibility, affordability, and rapid transmission of

⁴⁵ Alatawi, "A Survey on Echo Chambers on Social Media," 7; Bohan Jiang et al., "Mechanisms and Attributes of Echo Chambers in Social Media," *arXiv* 2106, no. 05401 (June 2021): 1, doi:10.48550/arXiv.2106.05401.

⁴⁶ The term 'web 2.0' refers to the second generation of the World Wide Web, characterized by the shift from static web pages to dynamic and interactive user-generated content, as well as the proliferation of social media platforms, blogs, wikis, and collaborative tools. In the context of radicalization, this era provided unprecedented opportunities for extremist groups to disseminate propaganda, recruit members, and amplify their ideologies through interactive digital platforms.

information.⁴⁷ Nevertheless, the authenticity and reliability of the information circulated through social media are often regarded as inferior to that of conventional news media, primarily due to absence of an adequately equipped regulatory framework in Pakistan.⁴⁸ Consequently, individuals exploit the public's perception by utilizing echo chambers to disseminate misinformation and disinformation. Echo chambers exclude dissenting opinions, make users insist on their confirmation bias, and let misinformation go viral.⁴⁹

Hence, Misinformation and Disinformation frequently lead to the formation of social trends. Extremist and Radical Groups use SMNs to display controversial topics as social trends to draw users' attention, whereby top trends are encapsulated in a few trending terms or hashtags.⁵⁰ In this way, terrorist organizations gain broad coverage, promote like-minded perspectives, and wield social influence, as information circulated within social media echo chambers helps generate trending topics.

These social trends significantly impact users' cognition which is also referred to as "online brain".⁵¹ Emotional contagion can cause people to experience the same emotions unconsciously. According to a new study, echo chambers expose and amplify intense emotions. This manifestation is frequently created by consumers constantly bombarded with erroneous content and

⁴⁷ Kai Shu and Huan Liu, "Challenging Problems of Fake News Detection," in *Disinformation, Misinformation, and Fake News in Social Media: Emerging Research Challenges and Opportunities* (Basingstoke: Springer Nature, 2020), 55, doi:10.1007/978-3-031-01915-9_4.

⁴⁸ Hassan Khalil, "Algorithmic Bias and Political Polarization: Analyzing the Role of News Aggregators and Social Media in Pakistan," *PAKISTAN LANGUAGES AND HUMANITIES REVIEW* 8, no. II (June 2024): 755, doi:10.47205/plhr.2024(8-ii)66.

⁴⁹ Bohan Jiang et al., "ChamberBreaker: Mitigating the Echo Chamber Effect and Supporting Information Hygiene through a Gamified Inoculation System," *Proceedings of the ACM on Human-Computer Interaction* 5, no. 2 (October 2021): 5, <https://doi.org/10.1145/3479859>.

⁵⁰ "Why is Pakistan's Pashtun movement under attack?" *Al-Jazeera*, January 28, 2020, <https://www.aljazeera.com/news/2020/1/28/why-is-pakistans-pashtun-movement-under-attack>.

⁵¹ Joseph Firth et al., "The "online brain": How the Internet may be Changing Our Cognition," *World Psychiatry* 18, no. 2 (May 2019): 119, doi:10.1002/wps.20617.

conspiracy theories.⁵² Active users in the echo chamber experience higher levels of emotion than less active users. Studies find that greater involvement in the echo chamber promotes more unfavorable mental habits.⁵³ Scholars have presented experimental evidence that emotional contagion can occur without a direct connection between people and absent nonverbal signs.⁵⁴ These forms of echo chambers are difficult to discover on social media using content- or network-based techniques.

Owing to these factors, radicalization and political polarization has increasingly been on the rise in Pakistan. This polarization in Pakistan has contributed to increased corruption, improbity, sectarian conflicts, chauvinism, religious radicalism, socio-economic disparities, and even political instability.⁵⁵ These phenomena make individuals vulnerable to HNT. Subsequently, individuals develop a tendency to impulsively react to any social and political changes in the society.

3. Strategies Employed by Radical Groups and Mitigating Techniques to Counter Them

Radical and extremist groups in Pakistan employ various strategies that leverage mechanisms of influence, particularly through echo chambers and algorithms, to propagate their ideologies and recruit members.⁵⁶ These strategies

⁵² Mansoorh Karami, Tahora H. Nazer, and Huan Liu, "Profiling Fake News Spreaders on Social Media through Psychological and Motivational Factors," *Proceedings of the 32nd ACM Conference on Hypertext and Social Media* 5, no. 21 (August 2021): 226, doi:10.1145/3465336.3475097.

⁵³ Joshua Davis, "Faculty Opinions recommendation of Experimental evidence of massive-scale emotional contagion through social networks," *Faculty Opinions – Post-Publication Peer Review of the Biomedical Literature* 111, no. 24 (June 2014): 8788, doi:10.3410/f.718431311.793500193.

⁵⁴ Davis, "Faculty Opinions recommendation of Experimental evidence of massive-scale emotional contagion through social networks," 8789.

⁵⁵ Dr. Raja A. Hanif, Iqra Sultan, and Muhammad Haqeeq, "Political Polarization Issues and Challenges Faced by Pakistan," *NDU Journal* 38, no. 1 (March 2024): 41, doi: 10.54690/ndujournal.38.181.

⁵⁶ Muhammad Irfan, Ziyad Abdulaziz Almeshal, and Muhammad Anwar, "Unleashing Transformative Potential of Artificial Intelligence (AI) in Countering Terrorism, Online Radicalisation, Extremism,

are often indirectly facilitated by SMNs, bias algorithms, echo chambers and are intertwined with the broader socio-political landscape of Pakistan.

Echo chambers create isolation from dissenting views by fostering environments where only their narratives are promoted. This isolation helps reinforce existing beliefs among followers, making them more susceptible to extremist ideologies. Groups like TTP, Hafiz Gul Bahadur Group (HGBG), and Zainbiyoun Brigade (ZB) use digital media platforms to spread their narratives through speeches and from online forums.⁵⁷ In 2017, Gandhara published that these organizations have 412 social media pages on Facebook, YouTube, X, and JustPaste.it.⁵⁸ Echo chambers often manifest in online communities where members share similar grievances, experiences, and ideologies. For instance, platforms like Facebook and Telegram have been used by groups like BLA, TTP, and ISIS to build networks that facilitate recruitment and radicalization, providing a sense of belonging to individuals who may feel marginalized.⁵⁹ The narratives promoted within these echo chambers often resonate deeply with local cultural and political sentiments. It allows radical groups to frame their ideologies as legitimate responses to perceived injustices or grievances against the state or foreign powers.⁶⁰ This framing is crucial in attracting support and legitimizing extremist actors.⁶¹ The BLA, for instance, tactically used social media in the Herof attack, amplifying the narrative of "War for Oman."⁶²

and Possible Recruitment," *Global Strategic & Securities Studies Review* VIII, no. IV (March 2024): 2, doi:10.31703/gsssr.2023(viii-iv).01.

⁵⁷ Naveed Hussain, "Web of terror: how militants weaponise social media," *Tribune*, April 13, 2015, <https://tribune.com.pk/story/2539542/web-of-terror-how-militants-weaponise-social-media>.

⁵⁸ Gandhara, "Banned Pakistani Militant Groups Thrive On Social Media," Radio Free Europe, last modified August 21, 2017, <https://gandhara.rferl.org/a/pakistan-militant-groups-on-social-media/28684230.html>.

⁵⁹ Amil Khan, *Pakistan and the Narratives of Extremism*, (US: USIP, 2022), <https://www.usip.org/sites/default/files/SR327-Pakistan-and-the-Narratives-of-Extremism.pdf>.

⁶⁰ Khan, *Pakistan and the Narratives of Extremism*, 8.

⁶¹ Khan, *Pakistan and the Narratives of Extremism*, 7.

⁶² Sajid Aziz, "Digital Warfare: The Baloch Liberation Army's Tactical Use of Social Media in the Herof Attack," *GNET*, last modified November 8, 2024, <https://gnet-research.org/2024/11/08/digital-warfare-the-baloch-liberation-armys-tactical-use-of-social-media-in-the-herof-attack/>.

Digital media algorithms are pivotal in determining what content users see based on their engagement patterns. Radical and extremist groups exploit these algorithms by creating highly engaging content likely to be shared among like-minded individuals, increasing their visibility and reach. This targeted approach allows them to bypass traditional barriers and information dissemination.⁶³ These groups manipulate social media trends to draw attention to their causes by using hashtags and trending topics, for example, *#Sanctionpakistan* was created to damage the reputation of Pakistan worldwide by groups like BLA.⁶⁴

Platforms	Digital appearance	Examples	Tactics
YouTube	Umer Media	Fedayeen Heroes Notorious Message to the Pakistani Military	HD combat footage, ideological sermons, and alleged martyr tribute
Telegram	TTP Updates	Fallacious claims of healing Balochistan	Encrypted communication and IED construction
Twitter	PakTaliban_Official UmarUpdates	<i>#UmarMedia</i> <i>#TTPFighters</i>	Use of hashtags, frequent account switching
Facebook	Anonymous Private groups	Sharia for Pakistan	Limited groups to avoid moderation
WhatsApp	Private groups	Encrypted recruitment	Secure sharing of fundraising appeals and logistical plans
Instagram	Visual content	Propaganda posters and quotes	Misuse of trending cultural imagery

⁶³ Madiha Afzal, *Pakistan Under Siege: Extremism, Society, and the State* (Washington: Brookings Institution Press, 2018), 51, <http://www.jstor.org/stable/10.7864/j.ctt1hfr16s>.

⁶⁴ Soufia Kausar, Bilal Tahir, and Muhammad A. Mehmood, "Towards Understanding Trends Manipulation in Pakistan Twitter," *arXiv* 2109, no. 14872 (September 2021): 15, <https://arxiv.org/pdf/2109.14872>.

Thus, the growing influence of algorithms and echo chambers in fostering radicalization requires targeted strategies to mitigate their effects. The mitigation strategies need immediate attention to eliminate present echo chambers and prevent them in future. These strategies must address both the technological and human aspects of the problem, focusing on creating a balanced digital ecosystem that prevents the spread of extremist ideologies while promoting critical engagement and diverse perspectives.⁶⁵ Specifically, strategies that target algorithms must aim to tackle the root causes of the formation of echo chambers from which algorithmic content is recommended. On the other hand, user-centered strategies focus on empowering individuals to take greater control over their digital environment by encouraging them to critically evaluate the quality of information they engage with.⁶⁶

Algorithmic strategies must include algorithmic transparency and accountability, focus on the objectivity of machine learning algorithms, inspection for biased recommender systems, and convert biased algorithmic recommenders to unbiased algorithms for depolarization process.⁶⁷ One of the primary challenges in addressing the role of algorithms is the lack of transparency in SMNs' curated and algorithmic content. Governments, tech companies, and civil society must collaborate to make algorithmic processes more transparent. Technologically, the recommender system produces an echo chamber (polarized network) of users, embedded in a filter bubble and psychological dissonance.⁶⁸ The solution has 3 stages: the first stage is to address the polarized data to train

⁶⁵ Alatawi, "A Survey on Echo Chambers on Social Media," 7.

⁶⁶ Alatawi, "A Survey on Echo Chambers on Social Media," 11.

⁶⁷ Niklas Kossow, Svea Windwehr, and Matthew Jenkins, *Algorithmic transparency and accountability*, (New Zealand: Transparency International, 2021), https://knowledgehub.transparency.org/assets/uploads/kproducts/Algorithmic-Transparency_2021.

⁶⁸ Bashir Rastegarpanah, Krishna P. Gummadi, and Mark Crovella, "Fighting Fire with Fire: Using Antidote Data to Improve Polarization and Fairness of Recommender Systems," in *WSDM '19: Proceedings of the Twelfth ACM International Conference on Web Search and Data Mining* (New York: Association for Computing Machinery, 2019), 233, <https://doi.org/10.1145/3289600.3291002>.

the algorithmic recommendation system, inspect that data, and add additional training data so the algorithmic model easily differentiates between polarized and non-polarized content.⁶⁹ In the second step, after training the algorithmic model, change the recommender by slightly modifying the objective and allocating regularization terms to the function to prevent formation of echo chambers.⁷⁰ Lastly, the third step includes providing a counter-argument while detecting polarized content. This strategy in which individuals are exposed to counter/alternate narratives is more effective in deradicalization.⁷¹

The second method is the human aspect or human-intensive prevention model.⁷² This method includes promoting a counter/alternate narrative approach, psychological studies, media literacy, classifying misinformation and disinformation, education, regulation of DM, content moderation, implementation of algorithmic nudges to break the cycle, and a clear definition of freedom of speech content by the Pakistani government. Users of DM fail to realize that they are embedded within echo chambers because of blurred lines between misinformation, disinformation, and government policies.⁷³ So, there is a need to counter misinformation and disinformation by amplifying and introducing fact-checking techniques through authentic sources. While this process is complex and multifaceted, it is possible to attain it through a sustained and committed effort.

⁶⁹ Rastegarpanah, Gummadi, and Crovella, "Fighting Fire with Fire," 234.

⁷⁰ Uthsav Chitra and Christopher Musco, "Analyzing the Impact of Filter Bubbles on Social Network Polarization," in *WSDM '20: Proceedings of the 13th International Conference on Web Search and Data Mining* (New York: Association for Computing Machinery, 2020), 118, <https://doi.org/10.1145/3336191.3371825>.

⁷¹ Matan Orbach et al., "Out of the Echo Chamber: Detecting Countering Debate Speeches," in *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics* (New York: Association for Computational Linguistics, 2020), 7079, doi:10.18653/v1/2020.acl-main.633.

⁷² Alatawi, "A Survey on Echo Chambers on Social Media," 12.

⁷³ Anqi Shao, "Beyond Misinformation: A Conceptual Framework for Studying AI Hallucinations in (Science) Communication," *arXiv* 2504, no. 13777 (April 2025): 3, <https://arxiv.org/2504.13777v1>.

Thus, mitigating the influence of algorithms and echo chambers requires a multifaceted approach that addresses the technological mechanisms driving radicalization and the human vulnerabilities they exploit. By combining transparency, counter-narratives, education regulation, collaboration, and innovation, stakeholders can create a safer and more inclusive digital environment that can reduce the risk of radicalization in Pakistan and beyond.

4. Emerging Trends in Algorithms and Echo Chambers: Implications for Pakistan's Security Landscape

The landscape of digital algorithms and echo chambers is rapidly evolving, shaped by technological advancements and changing user behavior. Emerging trends include the increasing sophistication of artificial intelligence (AI), which drives personalized content delivery through predictive models.⁷⁴ These algorithms refine content recommendations and integrate technologies like generative AI and deepfakes to produce highly engaging but potentially misleading content.⁷⁵ Additionally, using adaptive algorithms, which learn and modify their behavior in real-time based on user interaction, further deepen the isolation of individuals within echo chambers.⁷⁶

Other trends, such as the rise of hyper-targeted advertising and attention maximization models, exploit users' vulnerabilities by promoting emotionally charged sensational content.⁷⁷ This creates a cycle of extreme engagement where divisive or polarizing narratives gain prominence.⁷⁸ Finally, the emergence of

⁷⁴ Vikas Khullar et al., "Opportunities and Challenges in AI Society 5.0," in *Artificial Intelligence and Society 5.0: Issues, Opportunities, and Challenges* (New York: Chapman and Hall/CRC, 2024), 53, doi:10.1201/9781003397052.

⁷⁵ Khullar et al., "Opportunities and Challenges in AI Society 5.0," 54.

⁷⁶ Khullar et al., "Opportunities and Challenges in AI Society 5.0," 112.

⁷⁷ Ricardo Correia and Dominyka Venciute, "The Influence of Artificial Intelligence on Advertising," in *AI Innovation in Services Marketing* (Hershey: IGI Global, 2024), 135, doi:10.4018/979-8-3693-2153-9.ch006.

⁷⁸ Correia and Venciute, "The Influence of Artificial Intelligence on Advertising," 136.

immersive technologies like virtual and augmented reality introduces new dimensions to how ideologies and narratives are experienced, potentially amplifying the radicalization process by making propaganda more visceral and immersive.⁷⁹

4.1. Implications for Pakistan

The reinforcement of echo chambers through algorithmic personalization and confirmation bias forces significant challenges for Pakistan's socio-political fabric. It contributes to heightened political polarization, weakens democratic deliberation, and fuels misinformation, particularly during election cycles or periods of political/social unrest. Marginalized voices and moderate perspectives are often drowned out, limiting constructive dialogue and consensus-building. Furthermore, the unchecked spread of sectarian and extremist narratives can exacerbate tensions among ethnic and religious groups, threatening internal security and social cohesion. In the long run, this digital environment risks undermining trust in institutions and eroding the public's capacity for critical engagement. In a nation with high social media penetration but limited digital literacy, advanced algorithms, and echo chambers significantly influence public opinion.⁸⁰ Reports show that Pakistan has the highest number of requests to get users' data and block content from X and Facebook.⁸¹ Extremist groups and radical groups are likely to leverage these technological trends to refine their recruitment strategies, create hyper-targeting propaganda, and deepen divisions within communities.⁸² The combination of AI-driven algorithms and weak

⁷⁹ Matthew J. Liberatore and William P. Wagner, "Virtual, mixed, and augmented reality: a systematic review for immersive systems research," *Virtual Reality* 25, no. 3 (January 2021): 774, doi:10.1007/s10055-020-00492-0.

⁸⁰ Fareeha Batool, "The Role of Social Media in Shaping Public Opinion in Pakistan," *Modern Diplomacy*, last modified November 1, 2024, <https://moderndiplomacy.eu/2024/11/01/the-role-of-social-media-in-shaping-public-opinion-in-pakistan/>.

⁸¹ Sindhu Abbasi, "The Problem With Pakistan's Tech Vision," *Dawn*, March 3, 2024, <https://www.dawn.com/news/1818749>.

⁸² Jacob Polatty, "Securing Veracity: Defenses Against the Pervasive Influence of Social Media," (master's thesis, Brown University, 2022), https://cs.brown.edu/media/filer_public/62/c2/62c29fd3-72cc-4aaf-aaf8-746571438018/polattyjacob.pdf.

regulatory frameworks of DM in Pakistan means that extremist content can spread unchecked, especially in remote and marginalized communities.⁸³ Nefarious external forces may also exploit echo chambers to polarize the populace, thereby inciting unrest and undermining trust in state institutions.⁸⁴ The introduction of defects and generative AI further complicates the security landscape, as these tools can be used to manipulate narratives, impersonate public figures, or disseminate disinformation at an unprecedented scale. Additionally, lacking a cohesive strategy to address algorithmic influence exacerbates vulnerabilities.⁸⁵ As a result, Pakistan has installed a national firewall that can track IP addresses, block content, and limit the visibility of DM platforms that are used as a tool for radicalization and propaganda.⁸⁶ While this firewall may benefit the government by tracking content in real-time, it does, however, raise ethical considerations and has some notable repercussions such as slow down of the internet as all content will have to flow through the filtering process.⁸⁷ These implications need immediate attention as Pakistan faces challenges in countering not only extremist propaganda but also the weaponization of algorithms by enemy forces, which could lead to widespread social instability, weakened government, and a rise in digital oppression.

4.2. What is Pakistan Lacking?

Despite recognizing the growing threat of digital radicalization, Pakistan remains ill-equipped to address the challenges posed by advanced algorithms and echo chambers. Key gaps include:

⁸³ Ifra Iftikhar, Irem Sultana, and Sajjad A. Paracha, "Balancing Act: Pakistan's Quest for Responsible Social Media Regulation," *Pakistan Journal of Law, Analysis and Wisdom* 3, no. 1 (February 2024): 223, https://www.researchgate.net/publication/379836756_Balancing.

⁸⁴ Khalil, "Algorithmic Bias and Political Polarization," 760.

⁸⁵ Khalil, "Algorithmic Bias and Political Polarization," 761.

⁸⁶ Sindhu Abassi, "Pakistan's Firewall Explained: Imposing a national internet firewall, the Pakistani government claims to be acting as an IT administrator," *Tribune*, September 8, 2024, <https://tribune.com.pk/story/2494442/pakistans-firewall-explained>.

⁸⁷ Abassi, "Pakistan's Firewall Explained."

Regulatory Weaknesses: While the Prevention of Electronic Crimes Act of 2016 aims to curb cybercrime, it lacks specific provisions for regulating algorithmic bias and addressing echo chambers created by SMNs.⁸⁸ Also, the Pakistan Telecommunication Authority (PTA) primarily focuses on blocking content, which is a reactive approach, rather than building preventive frameworks or engaging platforms to enforce transparency in their algorithms.⁸⁹

Limited Technological Expertise: Pakistan lacks the technological infrastructure and expertise to monitor and regulate algorithm-driven platforms effectively. There is no significant effort to develop indigenous AI solutions or tools that could help counter the spread of extremist content.⁹⁰ Current mechanisms rely heavily on manual monitoring, which is inefficient and inadequate for tackling the speed and scale at which extremist content spreads.

Policy Gaps: Pakistan has no comprehensive policy addressing AI's ethical use or algorithms' transparency. International frameworks like the European Union's Digital Services Act (EUDSA) or the AI ethics guidelines adopted by other countries could serve as models (Pakistan has yet to implement similar measures)⁹¹. There is also a lack of collaboration between the government, tech companies, and civil society organizations to create holistic solutions that address the root causes of algorithm-driven radicalization.

⁸⁸ Maheen Shafiq, "Framework for Social Media Regulations in Pakistan," *Journal of Mass Communication* 26, no. 4 (June 2022): 67, <https://www.jmcd-uok.com/index.php/jmcd/article/view/220/102>.

⁸⁹ Muhammad J. Hadi, "Safeguarding Critical Infrastructures Through Data Protection Laws: A Comparative Study with a Focus on Pakistan," *SSRN Electronic Journal*, February 2024, 28, doi:10.2139/ssrn.4730720.

⁹⁰ Prashant V. Matta, "From Data to Mind: Memory and Cognitive Liberty in the Age of Predictive Technologies," *OCAD University Open Research Repository*, April 2024, 30, https://openresearch.ocadu.ca/id/eprint/4410/1/Matta_Prashant.

⁹¹ Hannes Werthner et al., "European Approaches to the Regulation of Digital Technologies," in *Introduction to Digital Humanism* (Basingstoke: Springer, 2023), 623, doi:10.1007/978-3-031-45304-5.

Digital Literacy Deficit: A significant gap exists in digital literacy among the Pakistani population, leaving users vulnerable to manipulation by algorithms and extremist narratives. Educational initiatives to promote critical engagement with digital content are virtually absent. Without empowering users to recognize and challenge echo chambers, the cycle of radicalization will continue to persist.

Thus, the emerging trends in algorithms and echo chambers present a growing threat to Pakistan's social and political stability. With inadequate regulatory frameworks, limited technological expertise, and a lack of proactive policies, the country faces significant challenges in countering the influence of these digital mechanisms. Strengthening PECA, reforming PTA's approach, and fostering collaboration between stakeholders are critical steps towards mitigating the risk associated with algorithmic influence and ensuring a safer digital environment for Pakistan's citizens.

5. Conclusion

The role of algorithms and echo chambers in shaping the digital media landscape has profound implications for the spread of radical ideologies in Pakistan. Echo chambers and algorithms work as mechanisms of influence. From the basic functioning of algorithms that curate content based on user preferences to the formation of echo chambers, these platforms isolate individuals within ideologically homogeneous spaces. By reinforcing biases and amplifying extremist content, these digital processes create fertile ground for radicalization, particularly in the context of Pakistan's socio-political and security dynamics. Echo chamber attributes further highlight their impact, as they foster group polarization, reinforce confirmation bias, and reduce exposure to diverse viewpoints. These factors not only accelerate the ideological divide but also create a feedback loop that strengthens extremist narratives. Radical groups exploit these mechanisms by tailoring their strategies to leverage algorithmic

recommendations and build cohesive, insular communities that support their agendas.

Potential mitigation strategies for addressing these challenges must include efforts to reduce the influence of algorithms and echo chambers. They must focus on increasing algorithmic transparency, promoting counter/alternate narratives, enhancing media literacy, and implementing collaborative measures among governments, tech companies, and civil society. These approaches aim to disrupt this cycle of radicalization while empowering users to engage with digital content and explore diverse perspectives.

In conclusion, algorithms and echo chambers are not inherently negative phenomena, but their misuse in Pakistan's digital media ecosystem has contributed to the proliferation of radical ideologies and socio-political polarization. Understanding and addressing these mechanisms is crucial for fostering a safer and more inclusive digital environment. The insights provided in this paper lay the groundwork for tackling the spread of extremism and radicalization in the Pakistani society.