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CLUSTERS OF CYBER SOCIETIES: ONLINE COMMUNITIES, SOCIAL NETWORKS, AND THE EMERGENCE OF AI-DRIVEN CYBER-HUMAN SOCIAL SYSTEMS

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ABSTRACT

Digital social life is increasingly organized through clusters: communities of users connected by shared identities, interests, information sources, and patterns of interaction. These clusters are not produced by human affiliation alone. Contemporary social networks embed artificial intelligence (AI) in recommendation, ranking, moderation, content generation, and social discovery, creating environments in which human and machine agency jointly structure communication. This paper conceptualizes clusters of cyber societies as sociotechnical formations produced through the interaction of human sociality, platform architecture, and AI-driven mediation. Drawing from research published from 2020 onward, it argues that AI has moved from a background computational tool to a constitutive actor in the cyberhuman social systems. AI can increase belonging, personalization, access to information and community support, yet it can also intensify homophily, amplify polarizing or misleading content, blur distinctions between human and synthetic participation and weaken epistemic trust. The analysis further shows that neither human behavior nor algorithms alone adequately explain the dynamics of cyber societies; their effects emerge through feedback loops between users and technical systems. The paper concludes that governance should treat online communities as hybrid social systems requiring transparent algorithmic design, accountable AI-mediated communication, human oversight, and protections for collective as well as individual well-being.

KEYWORDS: Cyber Society, Online Communities, Social Networks, Artificial Intelligence, Human–Ai Interaction, Algorithmic Clustering.

INTRODUCTION

The expansion of online communities has altered the structure of social life. Social networks are no longer peripheral communication tools used primarily to supplement offline relationships. They function as social environments in which people form communities, construct identities, exchange knowledge, mobilize around causes, establish norms, and encounter institutions. A useful way to understand this transformation is through the concept of clusters of cyber societies: relatively coherent formations of digitally connected actors whose interactions become organized around shared interests, identities, values, narratives, or goals. A cluster may appear as a tightly connected political community on X, a fandom on TikTok, a health-support group on Reddit, a professional network on LinkedIn, a gaming community on Discord, or a creator community organized across several platforms. What unites these formations is not merely that communication occurs online, but that social relations are increasingly shaped by computational infrastructures that determine visibility, connection, and participation.

The contemporary significance of these clusters derives from the growing role of artificial intelligence. AI is embedded in the systems that recommend posts, identify likely friends, rank comments, detect harmful material, predict user interests, target advertising, generate content, and increasingly assist users in composing messages. Sundar (2020) describes this development as the rise of machine agency: computational systems no longer operate only as passive channels but participate in decisions that will affect human communication. Hancock et al. (2020) similarly conceptualize Ai-mediated communication as interpersonal communication in which computational agents modify, augment or generate messages in pursuit of communicative goals. These developments complicate the traditional differences between human society and technological infrastructure because the social environment itself is becoming co-produced by human and machine actors.

This paper argues that clusters of cyber societies should be understood as cyber-human and AI-driven social systems rather than simply as online collections of people. Their structure emerges from three interacting forces: human tendencies toward affiliation and identity-based grouping, platform architectures that make certain forms of interaction possible, and AI systems that personalize, rank, filter, generate, and govern information. The central claim is not that algorithms mechanically determine social outcomes. Rather, contemporary cyber

societies are generated through feedback loops in which users train and respond to algorithms while algorithms alter the informational and relational environments in which users make choices. This framework explains both the benefits of online clustering, including belonging and collective intelligence, and its risks, including polarization, misinformation, synthetic participation, privacy loss, and declining epistemic trust.

Conceptualizing Clusters of Cyber Societies

The term cyber society can be used too broadly if it simply refers to any social activity conducted through digital technology. A more analytically useful approach is to view cyber society as a sociotechnical social order in which interpersonal relations, institutions, norms, and information processes are inseparable from computational systems. Recent scholarship on online communities supports this approach. Membership can provide support, identity, information and solidarity, but communities can also amplify harmful norms or trends and transfer online behaviors to offline life. The significance of a cyber-society cluster therefore lies in the combination of network structure and shared social meaning.

Clustering occurs because people do not interact randomly. People could select communities that shows their interests, identities, needs, beliefs and these type of relationships are reinforced through working together repeatedly. In network terms, clusters emerge when connections are denser within a group than between that group and the rest of a network. Social processes such as homophily: preference for similar others, contribute to this structure. Cinelli et al. (2021), comparing several social media platforms, found evidence that homophilic interactions and even biased information diffusion contribute to echochamber dynamics, although the strength and form of those dynamics vary across several platforms. The platform therefore matters: different technical architectures produce different opportunities for exposure, interaction and segregation.

The concept of clustering should not be reduced to political echo chambers. Cyber societies include communities organized around health, education, entertainment, profession, ethnicity, gender, hobbies, consumption, or local issues. The clustering mechanism may be relational, as when users follow one another directly; informational, as when users repeatedly encounter similar content; or algorithmic, as when recommendation systems infer affinities that users have never explicitly declared. These mechanisms can overlap. Taylor and Chen (2024), found that TikTok users reported better social connectedness when algorithmic personalization repeatedly presented identityrelevant content in ways users perceived as responsive to them. This finding illustrates a key feature of Ai driven cyber society:

individuals can experience a sense of belonging not only because they intentionally entered a group but because an algorithm continuously constructs an identity-relevant social environment around them.

Cyber-society clusters are consequently dynamic rather than fixed. Users enter and leave; platforms redesign interfaces; recommendation systems change; communities migrate across services; and new generative-AI capabilities alter who or what can participate. The appropriate unit of analysis is therefore not the individual user or the algorithm in isolation, but the sociotechnical relationship among users, communities, platform rules, machine-learning systems, and broader institutions.

How Algorithms Produce and Reinforce Social Clusters

The clustering of online communities begins with human social behavior, but contemporary platforms intensify and reorganize that behavior through algorithmic selection. Social media environments confront users with more information than they can process. Ranking and recommendation systems solve this attention problem by predicting what each user is most likely to view, click, share, or respond to. This creates a personalized information environment whose composition is partly determined by previous behavior. Kang and Lou (2022) show how human agency and machine agency interact on TikTok: users select, create and respond to content, while AI-based systems learn from those actions and curate subsequent consumption, creation and networking opportunities. The result is a recursive system in which user behavior becomes data for the machine and machine outputs become conditions for later human behavior.

Such recursion can produce beneficial relevance. A person who repeatedly interacts with material concerning a profession, health condition, cultural identity, or creative practice may quickly discover others with similar experiences. Algorithms can reduce the search costs associated with community formation and enable geographically dispersed individuals to build durable networks. Yet personalization can also narrow the range of people and ideas encountered. Cinelli et al. (2021) found out that the individuals on social platforms tend to interact within similar communities, creating structures where the information circulates within clusters and exchanges between clusters are not a lot. Importantly, this does not mean that algorithms alone create polarization. Human selection, existing identities, elite cues, platform affordances and recommendation systems interact in complex ways.

The empirical literature reinforces this caution. Guess et al. (2023) in an experiment replaced Facebook and Instagram algorithm ranked feeds with more of chronological feeds during the

2020 U.S. election. The intervention substantially changed what users saw and reduced engagement, yet it did not produce corresponding short-term changes in several measured political attitudes. This finding challenges simplistic claims that changing a ranking algorithm will automatically depolarize users. At the same time, a broader systematic review by Lorenz-Spreen et al. (2023) found that international literature shows that digital media use is linked to democratic benefits such as participation of politics and causes information consumption harms such as polarization, the exposure to wrong information and reduced trust in institutions. The proper conclusion is that algorithmic systems are not neutral and not independently causal in a simple sense. They operate in social feedback systems.

This relationship is described by Metzler and Garcia (2024) as an interaction between the social drivers and algorithm mechanism. Engagement-oriented algorithms respond to behavioral signals that are themselves socially produced while users adapt to the visibility incentives created by platforms. Emotionally charged, identity-affirming, or controversial material may receive attention because humans respond strongly to it; algorithmic ranking can then make that response more consequential by increasing exposure. Over time, a cluster can develop recognizable norms, vocabulary, authorities, enemies, and standards of evidence. The algorithmic macro-level behavior of the social system cannot be understood solely by examining the intentions of users.

Generative AI adds another layer of machine agency. Instead of just determining if a human message is visible, an AI system may influence the wording, tone, evidence, visual representation or persuasive structure of the message itself. Saheb et al. (2024), reviewing the convergence of AI and social media, identify personalization, automated analysis, content generation, and algorithmic management as increasingly integrated functions. The line between social infrastructure and social actor is therefore becoming less stable. When AI composes a response that a human posts, moderates a dispute, recommends a community, or generates a synthetic account's content, the machine has participated in the social process even if a human remains nominally responsible for the account.

The distinction becomes still more important when artificial agents participate directly. Ng and Carley (2025), analyzing social-media activity across large-scale global events, found systematic differences between bot and human communication structures and language. Their findings demonstrate that social-media populations already contain both human and automated actors at meaningful scale. As generative models become more linguistically capable, distinguishing the two categories may become more difficult. Cyber societies may

consequently develop clusters in which humans interact with humans, humans interact with AI agents, and AI agents interact with one another while all contribute to the same visible information environment.

Experimental evidence suggests that this hybridization has social costs as well as benefits. Møller et al (2026) found that some forms of AI generated assistance can increase participation and content production in the social media discussions while simultaneously reducing perceived quality or check for authenticity. This tension is central to the future of cyber society. AI can lower barriers to expression for users who need help with language, confidence, accessibility, or information retrieval, yet pervasive assistance can create uncertainty about whether communication reflects a person's own knowledge, emotion, or intention. The cyber-human society is therefore not defined by the disappearance of humans. It is defined by the growing difficulty of separating human social action from computational mediation.

Social Benefits of Cyber-Society Clusters

A critical analysis of cyber societies should not treat clustering as inherently pathological. Social clusters are a basic feature of community life, and digital environments can create forms of connection that would otherwise be impossible. Oksanen et al (2024) proclaimed that online communities can provide social support and a good strong sense of belonging and fitting in. The benefit is significant when offline networks are restricted in locations or when individuals seek others with uncommon experiences. Digital groups can connect patients with similar conditions, diasporic populations, specialized professionals, minority interest communities and people engaged in collaborative learning or creativity.

AI can strengthen some of these benefits by improving discovery and accessibility. Recommendation systems can locate niche communities from weak behavioral signals; translation and language technologies can lower linguistic barriers; automated moderation can help detect abuse at scales that human moderators cannot manage alone; and generative tools can help users formulate questions or responses. Taylor and Chen's (2024) TikTok research is particularly important because it suggests that algorithmic personalization can contribute to social connectedness when users perceive that identity-relevant recommendations understand and validate aspects of the self. In this sense, the algorithm can function as a bridge between an individual and a community.

Cyber-society clusters also support forms of collective intelligence. Members can rapidly pool local observations, expertise, documents, and interpretations. During emergencies,

professional communities and civic networks can distribute information faster than many hierarchical organizations. AI-based summarization and classification may improve this capacity by helping communities process large volumes of material. However, the same mechanisms that efficiently aggregate useful knowledge can also aggregate error. The value of clustering therefore depends on the epistemic quality, governance practices, and incentive structures of the community rather than on connectivity alone.

Risks: Polarization, Synthetic Participation and Epistemic Trust

The strongest risks emerge when social clustering combines with engagement incentives, weak accountability and increasingly capable AI. Echo chambers are one manifestation. Cinelli et al. (2021) demonstrate that the social media users can form communities by selective information sharing. Once a cluster develops a shared interpretive framework, contrary information may be discounted not merely because of its content but because it originates outside the trusted group. This can transform information disagreement into identity conflict. Polarization should nevertheless be treated as a social process rather than a direct output of code. Lorenz-Spreen et al. (2023) shows that the relationships between digital media and democracy is diverse across outcomes and the national contexts. Guess et al. year (2023) further demonstrate that reducing algorithm ranking alone would not quickly change solidified political attitude. These findings suggest that cluster-level interventions must address social identity, community norms, incentives and information quality in addition to recommendation architecture. Algorithms can amplify pre-existing divisions, but people also actively seek, create, and reward identity-consistent material.

Generative AI introduces a second risk: synthetic participation. Online communities have historically depended on imperfect but meaningful assumptions about human presence. Users could not always verify identity yet they generally interpreted posts, comments, likes and replies as traces of human attention. AI-generated accounts and AI-assisted communication weaken that assumption. Ng and Carley (2025) show that automated accounts already differ from humans in characteristic patterns of interaction while the continuing development of generative systems is likely to make automated behavior more adaptive and conversational. The social meaning of popularity, consensus, outrage and community support becomes unstable when visible participation can be manufactured at low cost.

A related problem is authenticity. Burtch et al. (2024) argued that content produced by AI is destroying online knowledge in communities because machine-generated feedback is replacing human interaction. Without interacting with a community, if instant generated

answers are available, valuable human contributors may participate less. By the same token, the more synthetic contributions a community has, the more energy its members must spend to sort out which content represents real expertise or experience. Møller et al. (2026) found that AI assistance will increase activity but decrease the perceived quality. This is an example that more content does not necessarily lead to a healthier social environment.

These changes raise a deeper epistemic problem: what should the user believe? Sahebi and Formosa (2025) argue that AI mediated communication can lead to an epistemic trust dilemma. Reduced trust is rational when AI increases uncertainty about authorship, accuracy or responsibility but generalized suspicion can also unfairly discount legitimate communication that happens to be AI-assisted. In a cyber society where translation, accessibility tools, editing assistants, and generative systems are integrated into ordinary communication, a simple division between “authentic human” and “inauthentic AI” is inadequate.

The challenge is compounded by algorithmic opacity. Users frequently experience the outputs of ranking and recommendation systems without knowing why certain content has been selected or which behavioral signals were used. Kang and Lou (2022) show that users negotiate machine agency and sometimes attempt to train or even manipulate recommendation systems through their own behavior. Yet individual adaptation does not create institutional transparency. Users may learn how to influence a feed without understanding the objectives, trade-offs, or data practices embedded in the underlying system. Finally, cyber-society clusters create collective harms that are not reducible to individual exposure. A single misleading post may have limited impact, but repeated circulation within a dense community can normalize a false claim. A single automated account may be inconsequential, while a coordinated network can manufacture perceived consensus. An individually satisfying recommendation can contribute, at scale, to a fragmented public sphere. The principal governance problem is therefore systemic: optimizing each user’s immediate engagement may produce undesirable collective outcomes even when no individual interaction appears catastrophic.

Governance of AI-Driven Cyber Societies

Governance must begin from the recognition that cyber societies are hybrid social systems. Policies aimed only at removing harmful content after it appears are insufficient because platform architecture, recommendation objectives, automated participation, and AI-mediated communication all shape community dynamics before moderation occurs. The first

requirement is meaningful transparency. Platforms should disclose when content is mainly AI generated or when users are interacting with automated agents while avoiding simplistic labeling that stigmatizes benign uses such as translation or accessibility assistance. Transparency should also extend to the objectives of recommendation systems and the major categories of data used to personalize feeds.

Second, human oversight should remain central to consequential platform governance. AI can assist with moderation at scale but community rules involve context, cultural interpretation, fairness and competing values. Sundar's (2020) account of machine agency is useful here because it shifts attention from whether AI is technically capable of a task to how users perceive and respond to the agency delegated to the system. When an algorithm removes content, recommends sanctions, or suppresses visibility, users experience it as an exercise of governance. Appeals, explanations, and accountable human review are therefore essential components of legitimacy.

Third, platform design should be evaluated using collective as well as individual metrics. Engagement, watch time, clicks and retention measure user behavior but do not adequately measure community health. Oksanen et al. (2024) demonstrate that online communities can have some substantial real-world consequences while Metzler and Garcia (2024) emphasize feedback between algorithm mechanisms and the social drivers. Platforms should therefore assess whether recommendation systems contribute to harassment concentration, misinformation cascades, extreme segregation, or the displacement of human contribution, even when those systems increase short-term engagement.

Fourth, AI literacy should be treated as a form of social literacy. Users need practical understanding of algorithmic personalization, synthetic media, bots, generative assistance, and the limits of automated inference. This is not simply a technical educational problem. It concerns how people interpret social evidence. A high number of comments may not indicate broad human agreement; a polished message may not reflect expertise; and a personalized feed is not a neutral representation of public opinion. Cyber citizens require the capacity to reason about the computational construction of their social environment.

The long-term objective should not be to eliminate clustering. Communities depend on shared identity and repeated interaction. The goal should be to preserve the benefits of affiliation while preventing technical systems from converting ordinary social clustering into opaque, manipulable, or epistemically degraded environments. Governance therefore requires collaboration among platform designers, AI researchers, social scientists, regulators, community moderators, and users.

CONCLUSION

Clusters of cyber societies represent a major reorganization of contemporary social life. Online communities are no longer adequately described as human groups that happen to communicate through neutral technological channels. They are sociotechnical formations in which human affiliation, platform affordances, algorithmic ranking, automated moderation, generative content, and artificial agents interact continuously. The resulting cyber-human system can create powerful forms of belonging, knowledge sharing, accessibility, and collective action, but it can also intensify homophily, destabilize authenticity, manufacture participation, and weaken trust in shared information environments.

The central analytical lesson is that neither technological determinism nor purely human explanations are sufficient. Algorithms learn from people, people adapt to algorithms, and platform institutions define the incentives under which both operate. AI therefore functions simultaneously as infrastructure, mediator, and increasingly participant. As generative systems become embedded in everyday communication, the boundary between human society and artificial agency will become less distinct rather than more.

The future quality of cyber society will depend on whether governance can address this hybrid condition. Transparent design, disclosure of synthetic participation, human oversight, collective-impact assessment, and AI literacy can help preserve the advantages of digital community while reducing systemic harms. The relevant question is no longer whether society will become cyber-human. In many online environments, that transition is already underway. The more urgent question is what values, institutions, and accountability mechanisms will govern the clusters through which that society increasingly understands itself.

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