FACEBOOK ALGORITHMS AND USER POLARIZATION

EXPLORING METHODS TO ADDRESS COVID-19 INFORMATION ON FACEBOOK

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By
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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The cemented presence of social media and the internet in contemporary lives has permanently altered the way in which today's society and economy interact. Virtually anything can be marketed online and ordered to a customer's doorstep, and the internet makes the vast majority of people and companies just a message away. Social movements like Black Lives Matter have thrived through rapid information spreading, and American voter turnout has skyrocketed within the past decade largely in thanks to social media networks (Usher-Layser 2016).

As with any technology though, negative effects have surfaced in direct response to the rise of social medias. Widespread health effects similar to those of addiction (Ryan 2014) have centered around these applications that aim to maximize engagement. As witnessed in the current pandemic and political atmosphere, misinformation has found ways to thrive using social media automation, most notably Facebook, as a medium (Acker, Chaiet 2020), successfully spreading false news about COVID-19 and political theories. Both my technical report and tightly-coupled STS research will survey the effect of Facebook algorithms and functionalities on the society they operate in. The technical portion will be a State-of-the-Art paper, focusing on how Facebook feeds use different features and data to increase user engagement, and how that affects the user and Facebook environment. The tightly-coupled STS portion will explore research in how this tool has affected society at large, specifically within the context of COVID-19 misinformation spreading and political polarization.

Facebook Business Model

This technical research will explore how Facebook's economic model engages users and operates within the existing producer-consumer dynamic. An objective of this work is to

investigate the current state of research on how this model has developed the user role and social platform itself, tightly coupling with the STS research analysis examines the effects in 2020 with respect to the pandemic.

While the actual algorithm details are private trade secrets of Facebook, the application model and business model that utilize this algorithm are relatively public knowledge. As broadly illustrated in Figure 1, Facebook acts as a super-efficient medium through which companies and advertisers can instantly reach a massive audience that they previously did not have easy access to (Zhang 2019). Vendor parties heavily invest in this platform's ad space, trusting that this will

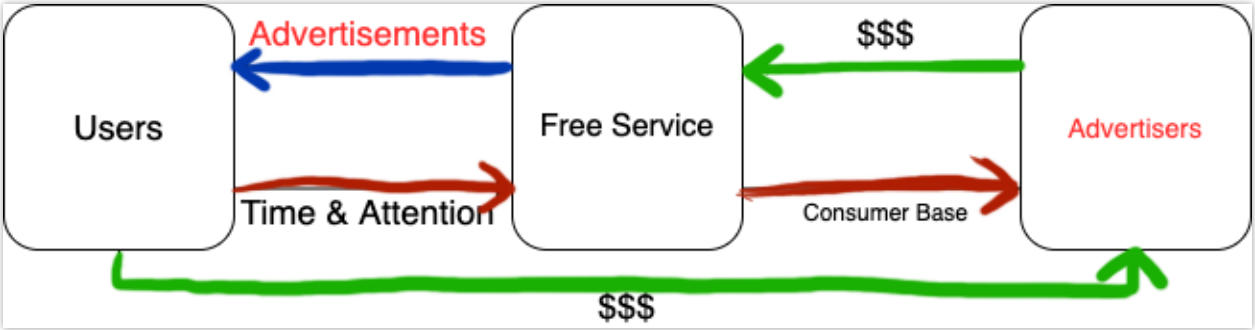

Figure 1: Simplified Facebook business model. Facebook (Free Service) acts as the medium through which businesses can optimize their return on advertising. (Created by White, 2020)

turn a profit and maintain a consumer base effectively. Conceptually, this model follows the idea known as Social Networking Marketing (SNM), which leverage Facebooks ability to manifest communities in addition to target advertisements (Liao, Hsian, Wu 2014). In addition to providing a space for users to react and voice opinions on products and ideas, this social model recognizes that "links between consumers exist", often illustrated by similarities in demographics or interests. Unlike before, a user share or opinion will have a ripple effect in these online networks that is much more significant with respect to revenue growth (Zhang 2019).

This vast potential for marketing revenue caused a huge marketing shift towards social media, but the direct success of marketing online now rests on "how well business models utilize the website (Facebook) as a marketing tool" (Liao, Hsian, Wu 2014). As visualized in the above Figure 1, Facebook, still being a capitalist entity, has a goal of optimizing revenue stream for itself, which can be equated to optimizing itself as a marketing and user platform (Kirkpatrick 2020). There are two logical ways to boost cash flow: increase the number of company tenants, and increase how much each tenant will pay. Many studies have concluded that "targeted ads are more effective than non-targeted ads, leading to substantial saving in the advertising budget" (David 2016) and being able to entice companies with a higher return rate for their advertising dollar. News feed algorithms have been employed to fuel both of these motivations (Liao, Hsian, Wu 2014).

News Feed Algorithm Relevance

In an article that offers an outstanding graphic on Facebook's model, the authors, Liao, Hsian, and Wu illustrate a flowchart that shows how user information, like groups and post interaction data, is used as inputs to a "Facebook service mechanism". This algorithm outputs all types of recommendations for a user, including direct marketing ads, friend suggestions, event recommendations, pages, and so forth – all with varyingly subtle motivations. These suggestions are "largely an outcome of iterative interactions between users and algorithms" (Cho, Ahmed, Hilbert, Liu, & Luu 2020). But this is the deepest lens possible to inspect the algorithm itself, which is black-boxed to the public. This elaborate private methodology Facebook uses has a massive impact on the development of communities online, also coined as "publics" by professors Mizuko Ito and Danah Boyd (Gillespie 2014).

Facebook's News Feed wants the user to keep scrolling and engaging with posts. The more the algorithm learns about the user, the better it can customize the feed to the account's predicted interests. As illustrated in Figure 2 below, the artificial intelligence uses data to model what content and ads will be most successful to a client. As Usher-Layser reminds us in her essay on *Facebook, Filtering and News Consumption*, human tendencies push us to engage more with people and sources that align with and confirm our opinions and world view (Usher-Layser 2016). It makes sense, and is important to note, that an algorithm, which boils down to a series of steps, does not *create* social behavior; rather, over time, it can assist in the amplification of biases or creation of "echo chambers" of opinionated groups online. In research that will be covered more in the STS portion, many authors highlight how this polarization of a user feed, in which the priorities are targeted ads and agreeable posts, decreases engagement across boundaries and is even described as being anti-democratic (Cho, Ahmed, Hilbert, Liu, & Luu 2020).

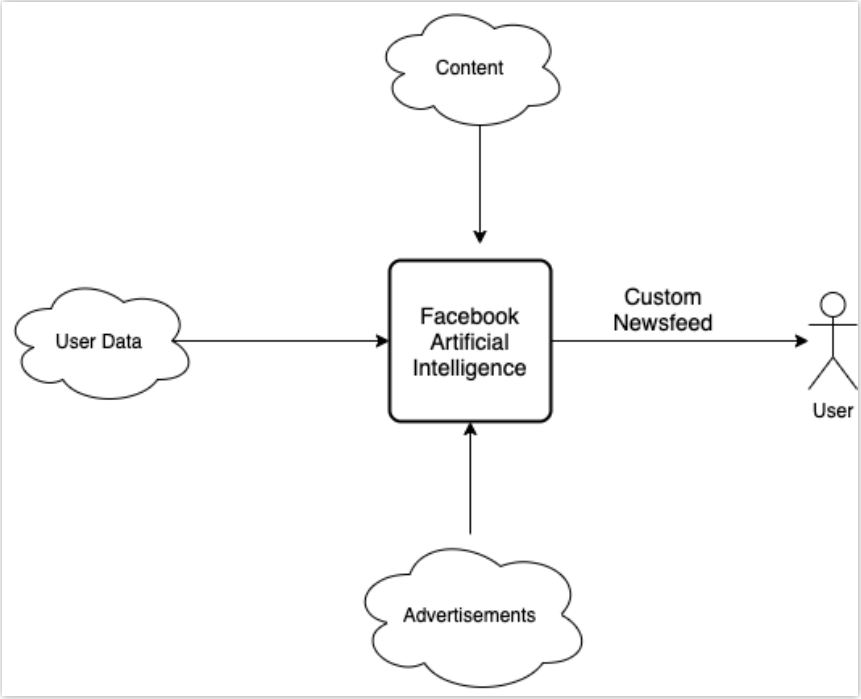

Figure 2 - User data is an input, and customized Newsfeed from AI models are the output.

After extensive research is explored on the algorithm's role in marketing and user profile development, I aim to write a State-of-the-Art that can help clarify what direction can be taken;

specifically, what type of outputs should the algorithm aim for to mitigate excessive polarization online.

Social Effects on Democracy and the Pandemic in 2020

According to narrators in "The Social Dilemma", a documentary released in 2020, fake news spreads four times faster than real information (McDavid, Jodi 2020). This is a primary example of how algorithms, like the one Facebook uses, can inadvertently amplify human tendencies. The concept has materialized into that of "clickbait", but fake stories are more likely to be exciting or engage the user, which matches the desired output of the algorithm designed to maintain user attention.

Professors at Cornell's department of Science, Technology, and Society, Pinch and Bijker introduced a view on technology in 1987 coined as "Social Construction of Technology". This framework puts the technology within the interpretation of different social groups, treating each as different and having different and significant roles on the development of the technology. Businesses come with financial motives, social groups come with social motives, users come with personal motives, and all of these needs are influential, to different degrees, on how the technology develops.

In order to best contextualize how Facebook operates within our political and economic societies, (Bijker and Pinch 1987). Figure 3 below uses Social Construction of Technology (SCOT) to illustrate how the Facebook engineer, as the platform through which so much of this interaction occurs, takes the responsibilities of mediating the needs of all the relevant groups. These groups all interact with Facebook's app (and other groups) in a different way and are benefactors of different effects of automated marketing and news feed creation.

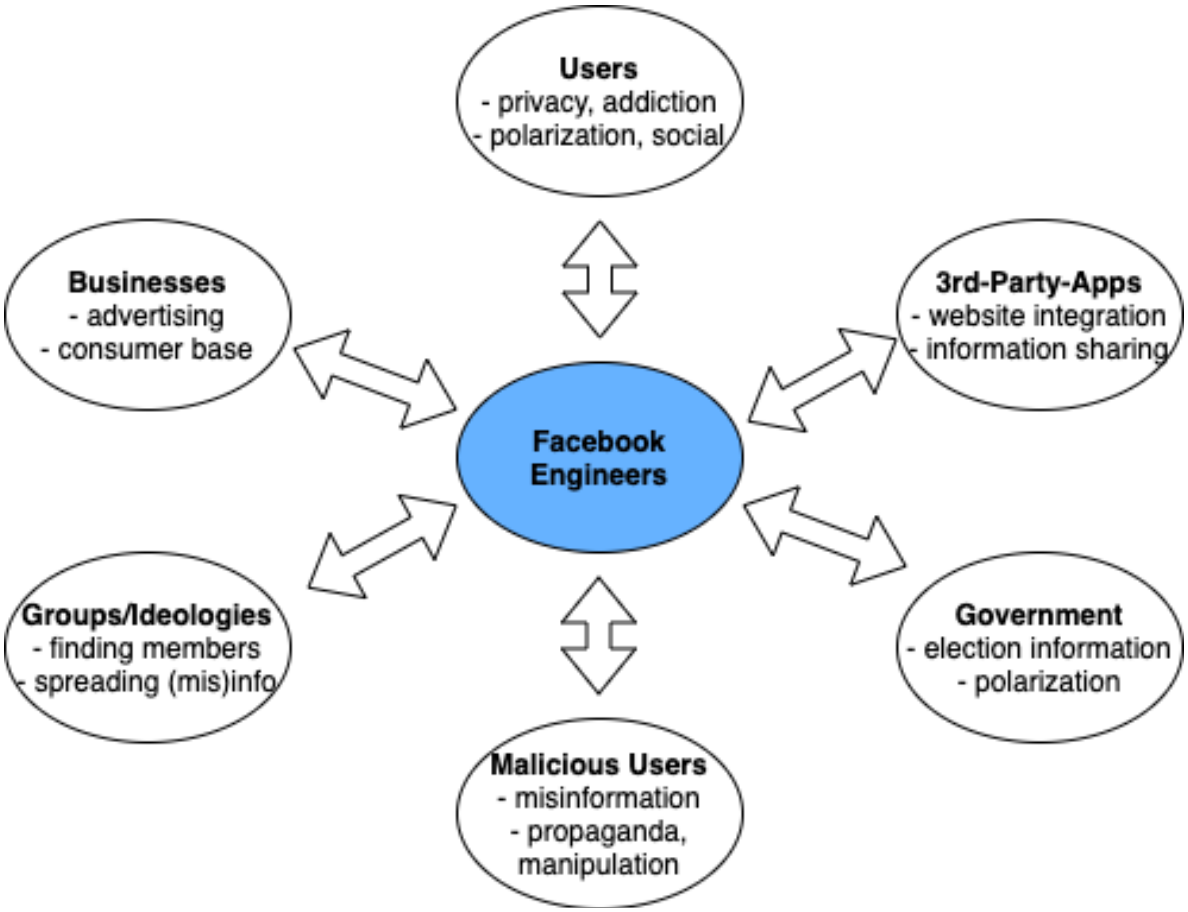

Figure 3: SCOT Theory of Facebook and its algorithm. As the medium through which every party communicates, Facebook engineers are responsible for the management of this environment; their capability of doing so has come under fire in 2020. (Adapted by White in 2020 from Bijker and Pinch 1987)

It is through these interactions that different groups and demographics are affected; notice how none of the interactions necessarily originate in the center node. Pieces of misinformation, for example, can be introduced by hackers, or third-party applications, and the Facebook algorithm could potentially utilize that as a method with which to engage a user who may be susceptible. Two professors at Texas University, Acker and Chaiet, offer commentary on how this occurred with the misinformation surrounding the coronavirus pandemic and 5G. In this case, the “coronavirus infodemic”, as coined by Zaracostas, was perpetuated by a technique that used third-party web archives to appear legitimate. A news feature that Facebook introduced

ended up making much disinformation format similarly to real news articles (Acker, Chaiet). Facebook Groups are often where misinformation can incubate, and people like the government and users can suffer as a result of this bad information. This has occurred periodically throughout recent history, with notable examples being anti-vaccination and anti-environmentalist rhetoric, along with extremist groups like QAnon.

The goal of continuing this research will be to explore how different sub-groups are affected by algorithm automation on Facebook's news feed, whether that be through marketing, groups, or news. Deeper understanding of how these methods work within our society will help engineers to better maintain an integrated environment online that can truly optimize the use of social media to move democracy and humanity forward, not just capitalist agendas.

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