Engineering Addiction in the 21st Century

"Doom scrolling"[16]

ABSTRACT
Companies' utilization of the "infinite scroll" has been increasing following the sudden rise of platforms like TikTok since the beginning of the COVID-19 pandemic. Their exploitation of younger plastic minds during mental and emotional hardship has infringed upon their rights by withholding the knowledge of the possible consequences of media reliance and gratification.

INTRODUCTION
According to a recent study conducted by Business of Apps, the average TikTok user in the United States spends an hour and eight minutes on the app a day [1]. The same study found that around "28% of users are under the age of 18 and 35% of users are ages 19-29" [1]. These are official numbers released by the company and do not factor in the wide number of users who are under the required age of 13. The app is structured into two sections, the 'Following' page and the 'For You' page which collects a queue of videos that the algorithm derives from the interests you express as a new user and adjusts for things you indicate you're not interested in [1]. In this way, the user always has curated content in the form of a constant stream of new videos that range from just seconds to a few minutes. With this short content, the user can simply see the next video in the queue by just scrolling down. The consumption of this content generation has been referred to as "doom scrolling" or "infinite scrolling".

SPREAD OF THE "ONE PAGE WONDER"
A single-page site is a webpage that does not require the user to click on anything in order to navigate through its content; instead, all of this content is produced as the user scrolls down [2]. The purpose of a user interface being set up this way is to stop readers from exiting the page after reading the desired content. What researchers found was that, after a user reads an article,

watches a video, or finds whatever content they were looking for, they soon navigate off the page[2]. In order to combat this, front-end designers implemented a more seamless transition to related content[2]. If it were an article, the user would no longer have to click on the next article, the next heading would appear right below the ending of the previous article. In a similar theme, video auto-playing is now becoming standard to prevent users from exiting the page. Soon, there would not even be a homepage on many sites, the initial domain would just be the start of the most popular article and use the infinite scroll feature[2].
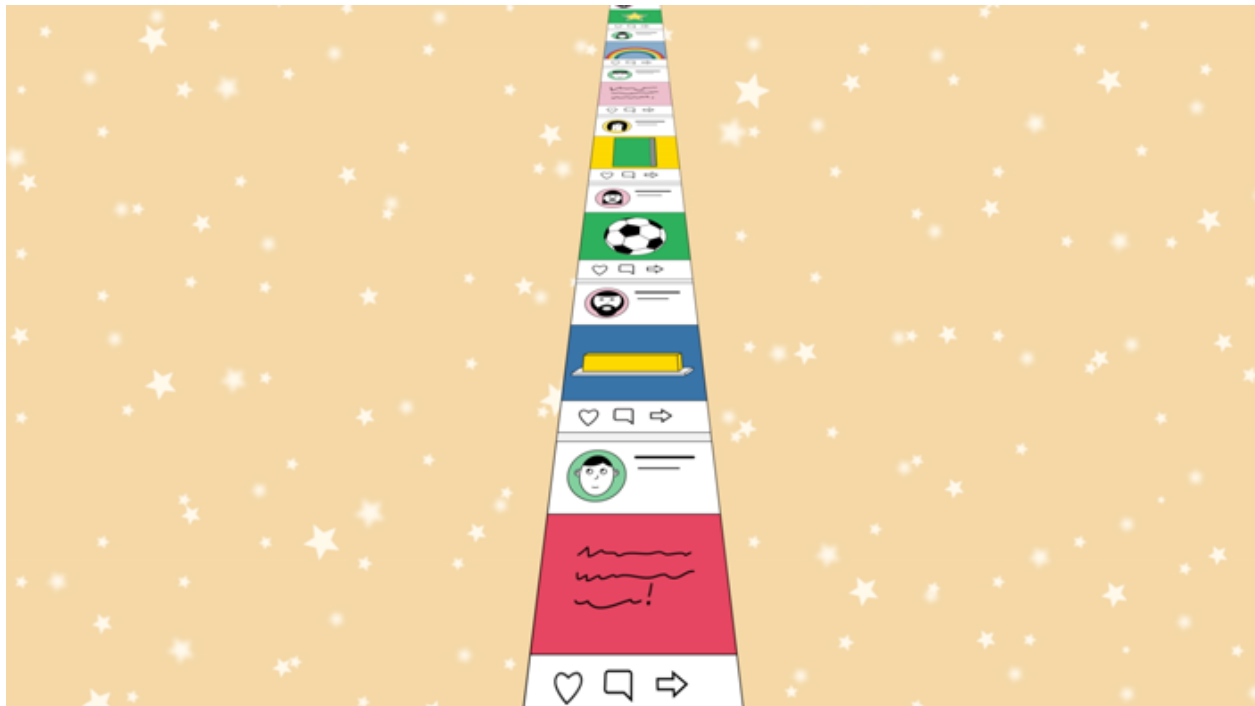
Infinite scrolling design [17]

WHY IT WORKS
The Uses and Gratification(U&G) theory was founded by researchers Jay G. Blumler and Elihu Katz in 1974 and is a communication theory that focuses on the needs, motives, and gratifications of media users [3]. Blumler and Katz claim that audiences choose to consume media for four distinct reasons: diversion or entertainment, personal relationships, personal identity, and surveillance [3].

Diversion defined in this context is a way for a consumer to pass the time and take a step away from the other parts of their lives [3][4]. In the U&G theory, consumers fictionalize personal relationships using the content found in media forms as a substitute for real emotional and interpersonal interaction [3]. The theory then states that consumers associate with characters and behaviors in media and use these as bases for their own actions and thoughts, i.e. their personal identity [3]. Lastly, Blumler and Katz state that consumers use media to gratify their need for information in the form of surveillance [3]. In this use case, the consumer is information-seeking and desires a feeling of being self-educated [4]. The theory suggests that forms of media have no real power over consumers. Instead, audiences are inherently attracted to high media usage to fulfill a certain need and then create their own meanings after they find it [4].

So why is content created by other users more attractive than, say, news articles that also implement the same infinite scrolling? A study on User Generated Media (UGM) in the early 2000s shows why consumers are so attracted to UGM specifically despite the ethos held by larger media and news organizations [5]. In other words, users are trending towards getting media content from social platforms even though news organizations hold the repertoire of being the most reliable and timely form of news [5]. Modern-age UGM's could be argued to have started in the 1990s, with users posting content on bulletin boards or discussions on platforms such as Yahoo and AOL but have taken more of a trend in recent years as users have identified the timeliness and power of UGM [5]. This study brings out other subcategories of the U&G theory that relate to more of a sense of belonging that audiences long for [5]. These can be found in the want to not only consume but, also, participate in and interact with UGM [5]. Consumers can do this by liking, sharing, reposting, commenting, etc. this content. An interesting development in recent years is the want for more people to be the ones being liked, shared, and commented on by participating in trends and creating their own content. This attempt at fame has created more complicated and deeper addictions today.

Micro-videos like those posted on TikTok, Instagram Reels, Youtube Shorts, etc., always have enough variety in content to appeal to each of these categories. These could be consumers' forms of diversion and help them get away from problems and use escapism to cope with difficulties as this form of content allows anyone to continue scrolling endlessly [4]. Personal relationships allow audiences to form "personal" connections with digital content creators and substitute these emotions and interactions with real interpersonal relationships. Companies and engineers have obtained more responsibility for consumers' time as the strict lockdowns during the pandemic have restricted people's movements enough to create this addiction to social media as a replacement for human interaction [6]. Personal identity with cultural transmission is the need for people to stay connected with the trends, behaviors, and values of the rest of the world [4]. This type of content is found regularly on social media with posts of food recipes, new outfits, home designs, and TikTok dances. Surveillance about the world around them is easy to find in this media form as consumers are able to post their own UGM if they want a message or a piece of news to be spread. The pure variety of content available on these platforms allow them to check all of these boxes, making them attractive and addictive to audiences.

MENTAL HEALTH CONCERNS AND THE ETHICALITY OF ITS EFFECTS
Studies on gratification and dopamine release found that reliance on social media for comfort is not only easy but, also, dangerous. The culture surrounding users' phones makes it so that our lives are never boring, but never really exciting either. The "proclivity toward instant gratification and constant entertainment"..."makes it easy to forget the repeated effort required to accomplish long-term goals and achieve success" meaning that we most likely end up pushing these long-term goals back [7]. Another study found that the continued peak in attention and brain activity allowed for the constant slow release of dopamine into the brain [8]. This slow release is addictive and our minds crash as soon as we put the phone down, urging our bodies to pick it back up constantly.

The influx of content available with such ease has caused a concerning correlation to depression and anxiety, specifically in today's youth [9]. Time spent on passive social media use (PSMU)

was positively associated with "higher levels of interest loss, concentration problems, fatigue, and loneliness"[9]. A few more studies found that, as an addicted person devotes more time to social media, they will have less time to devote to other vital things such as school, work, sleeping, caring for themselves, interacting with family, and interpersonal socialization[10]. Unsurprisingly, the person's school, work, health, and social life likely suffer. This leads to a spiraled decline in the person's mental health and physical well-being.

Studies have also found an association between internet addictions and a loss in the ability to reason accurately, think clearly, and engage in activities that call for concentrated thought[10]. Further, those who are addicted to content on the internet, suffer "a number of emotional deficits"[10]. This includes "depression, low self-esteem, social anxiety, alienation from family and peers, hostility toward others, and poor interpersonal relationships"[10].

Getty [18]

The Rights ethical framework by the Markkula Center for Applied Ethics states that a right is a justified claim on others [11]. These rights include both legal rights and moral/human rights [11].

Examining the benefits and consequences of the engineers' implementation of these features allow for the argument that these platforms as well as these engineers' actions are not ethical. The benefits of these features allow for the platform to generate more income and allow some users to view a healthy volume of content and view some things that they may have been interested in.

On the contrary, this infringes on the affected person's rights to health, education, thought, emotions, and life. The negative right, or liberty, to health is breached when addictive business models consume and negatively impact so much of a user's life that they no longer take care of themselves and are at risk of becoming ill in numerous ways. The Constitution requires that all be given equal educational opportunity. This legal right to education is hindered by excessive PSMU that is structured to be so addictive.

The liberty to thought is a negative human right to be able to not have your cognitive functions hindered by others. This is threatened when the user can no longer think clearly and consistently. Addictive PSMU is similar to the administration of a drug to a person's brain which is very clearly a violation of another's rights. The implementation of structures that produce emotional deficits transgresses that person's right to emotions. Not only does this person lose emotional relevance, but they are also doomed to face greater mental health issues such as depression, anxiety, and alienation.

The greatest violation of rights is the innate human right to life that is threatened by the cumulative consequences produced by these toxic and addictive social media structures. Just the stress of losing one or more of the above rights could pose a threat to one's self-view of their life and spiral into harmful tendencies. Any platform that infringes on the above rights by supporting these structures is undeniably immoral.

A finding discovered in the conclusion of [9] was the observation that PSMU is associated with concentration problems and aligns with research demonstrating that individuals who spend more time on PSMU were found to have lower attentional control[9]. This leads to the discussion for those who are particularly susceptible to these forms of media.

VULNERABLE POPULATIONS
There are three sets of population groups that are specifically exploited in these media forms: those with ADHD, those with autism spectrum disorder(ASD), and those growing up in lower-income communities.

9.4 percent of children and 4.4 percent of adults are diagnosed with ADHD and 2.21 percent of adults are estimated to have ASD in the United States[12][13]. A study of both of these populations and their inclination to give in to instant gratification was conducted in 2012. Developing children with ADHD were most enticed by the instant gratification, followed by those with ASD, and lastly, the control group[14]. The millions with these conditions are more easily influenced by the trap of infinite scrolling yet there are no attempts by these platforms to bring attention to these dangers which has proven to have negative consequences.

A study in 2019 found that those growing up in lower-income communities were exposed to screens two hours more per day than those living in wealthier communities[10]. Although it is important to spread digital literacy to all age and income groups, many of those in lower-income communities do not have the privilege of being taught the basics of preventing social media addiction and attachment. Therefore, that makes this "digital-use divide" more harmful in that those in this population are more likely to become addicted after prolonged exposure to these platforms.

The Justice and Fairness ethical framework by the Markkula Center for Applied Ethics states that society's justice is its fairness in treating individuals and groups, that people should be treated equally, given equal opportunities, and protected under the law regardless of their race, gender, or social status [11]. Fairness is to be reasonable, just, and impartial - treating everyone equally, without discrimination or favoritism, and ensuring that the rules and standards are applied consistently and transparently so that everyone has an equal chance to succeed [11]. The implementation of the infinite scroll directly contradicts the definition of fairness described in the justice framework as the populations described above. These demographics have a clear disadvantage when it comes to their risk of addiction. As described in the subheading above, these populations are even more vulnerable to the violation of their rights.

CALL TO ACTION
As per the IEEE Code of Ethics Article I.2, engineers must "improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies" and per Article I.1, "hold paramount the safety, health, and welfare of the public" and "disclose promptly factors that might endanger the public" [15]. In order to meet these requirements, engineers must conduct their own prior research on the potential consequences of their implementations that include infinitely scrolling designs as well as educate the audience on the potential harms of such features. The next contiguous action for engineers is to heed Article II.7 "to treat all persons fairly" and respect vulnerable population groups by making a clear and public distinction that those with ADHD, ASD, and those exposed to more screen time should be the most mindful of their volume of media consumption [15]. Lastly, engineers must follow Article III.10 "to support colleagues and co-workers in following this code of ethics" and Article I.5 "to seek, accept, and offer honest criticism of technical work" and "to acknowledge and correct errors" by refusing to implement or taking down such features immediately as well as educating peers about these issues [15].

CONCLUSIONS
These engineers, instead of acting with respect and declining to implement these features, choose to utilize these populations as guaranteed regular users of their services. Like a prescription bottle with no label, they disregard making public the drug called social media addiction and, instead, primarily aim to profit at the expense of consumers' lives and liberties. Although it is the platforms' business strategy teams making these propositions, it is the duty of the engineers and programmers to research and speak up when proposing these designs. Since it is the engineers who know how to implement these features, it is vital that we refuse to implement or take down such features immediately as well as educate peers about these issues.

ABOUT THE AUTHOR

Daniel Suh is a junior majoring in computer science (B.S.) and has always been interested in all engineering disciplines and the interconnectedness within the plurality of the sciences. In his free time, he likes to work on cars or play video games.

KEY SEARCH TERMS

Technology, Addiction, Social Media, Psychology

CONTACT INFORMATION

Email: dsuh8205@usc.edu
Phone: (916)945-4584

REFERENCES

[1]   S. Gudenau, "Is TikTok shrinking students' attention spans?" University Wire, 2021. Available: http://libproxy.usc.edu/login?url=https://www.proquest.com/wire-feeds/is-tiktok-shrinking-students-attention-spans/docview/2598094637/se-2. [Accessed: 24-Mar-2023].

[2]   Rondon, Michael. "One-Page wonder: infinite scroll: like the portal, nav bar and dropdown menu, infinite scroll is becoming another option for users to explore publishers' sites." Folio: the Magazine for Magazine Management, vol. 42, no. 5, June 2013, p. 24. Gale OneFile: Business, https://link.gale.com/apps/doc/A335733445/ITBC?u=usocal_main&sid=bookmark-ITBC&xid=df59cfef. [Accessed: 24-Mar-2023].

[3]   J. Gordon, "Uses and gratification theory - explained," *The Business Professor, LLC*, 2022. [Online]. Available: https://thebusinessprofessor.com/en_US/communications-negotiations/uses-and-gratification-theory-explained. [Accessed: 24-Mar-2023].

[4]   Whiting, A. and Williams, D. (2013), "Why people use social media: a uses and gratifications approach", Qualitative Market Research, Vol. 16 No. 4, pp. 362-369. https://doi-org.libproxy2.usc.edu/10.1108/QMR-06-2013-0041 [Accessed: 24-Mar-2023].

[5]   G. Shao, "Understanding the appeal of user-generated media: a uses and gratification perspective," Internet Research, vol. 19, (1), pp. 7-25, 2009. Available: http://libproxy.usc.edu/login?url=https://www.proquest.com/scholarly-journals/understanding-appeal-user-generated-media-uses/docview/219844913/se-2. DOI: https://doi.org/10.1108/10662240910927795. [Accessed: 24-Mar-2023].

[6]   P. Shope, "Commentary: TikTok destroyed my attention span," University Wire, 2022. Available: http://libproxy.usc.edu/login?url=https://www.proquest.com/wire-feeds/commentary-tiktok-destroyed-my-attention-span/docview/2626931348/se-2. [Accessed: 24-Mar-2023].

[7]   S. Bradsky, "Instant gratification diminishes power of boredom," University Wire, 2021. Available: http://libproxy.usc.edu/login?url=https://www.proquest.com/wire-feeds/instant-gratification-diminishes-power-boredom/docview/2583374237/se-2. [Accessed: 24-Mar-2023].

[8]   J. Hilotin, "Deadly scroll without end: How infinite scroll hacks your brain and why it is bad for you," Gulf News, 2023. Available: http://libproxy.usc.edu/login?url=https://www.proquest.com/newspapers/deadly-scroll-without-end-how-infinite-hacks-your/docview/2779124841/se-2. [Accessed: 24-Mar-2023].

[9]   Aalbers, G., McNally, R. J., Heeren, A., de Wit, S., & Fried, E. I. (2019). Social media and depression symptoms: A network perspective. Journal of Experimental Psychology: General, 148(8), 1454-1462. doi:https://doi.org/10.1037/xge0000528 [Accessed: 24-Mar-2023].

[10]   V. R. Bhargava and M. Velasquez, "Ethics of the Attention Economy: The Problem of Social Media Addiction," Business Ethics Quarterly, vol. 31, no. 3, pp. 321–359, 2021.Available: https://www-cambridge-org.libproxy1.usc.edu/core/journals/business-ethics-quarterly/arti

cle/ethics-of-the-attention-economy-the-problem-of-social-media-addiction/1CC67609A12E9A912BB8A291FDFFE799 [Accessed: 24-Mar-2023].

[11] S. C. University, "Ethical decision making," Ethical Decision Making - Markkula Center for Applied Ethics, https://www.scu.edu/ethics/ethics-resources/ethical-decision-making/ [Accessed May 8, 2023].

[12] S. Zauderer, "45 ADHD statistics: How many people have ADHD?," Life-Changing ABA Therapy - Cross River Therapy, 2023. [Online]. Available: https://www.crossrivertherapy.com/adhd-statistics#:~:text=In%20the%20U.S.%2C%20studies%20indicate,than%20in%20other%20ethnic%20groups. [Accessed: 24-Mar-2023].

[13] "Key findings: CDC releases first estimates of the number of adults living with autism spectrum disorder in the United States," Centers for Disease Control and Prevention, 07-Apr-2022. [Online]. Available: https://www.cdc.gov/ncbddd/autism/features/adults-living-with-autism-spectrum-disorder.html. [Accessed: 24-Mar-2023].

[14] Demurie, E., Roeyers, H., Baeyens, D. and Sonuga-Barke, E. (2012), Temporal discounting of monetary rewards in children and adolescents with ADHD and autism spectrum disorders. Developmental Science, 15: 791-800. https://doi-org.libproxy1.usc.edu/10.1111/j.1467-7687.2012.01178.x [Accessed: 24-Mar-2023].

[15] "IEEE Code of Ethics." IEEE Board of Directors, Jun-2020.

[16] M. Dennis, "'wasting time on social media? 6 ways to stop ADHD brains from doom scrolling,'" ADDitude, 07-Feb-2023. [Online]. Available: https://www.additudemag.com/doom-scrolling-wasting-time-on-social-media-adhd/. [Accessed: 24-Mar-2023].

[17] "Digital Media Literacy: Why we can't stop scrolling," GCFGlobal.org, 2023. [Online]. Available: https://edu.gcfglobal.org/en/digital-media-literacy/why-we-cant-stop-scrolling/1/#. [Accessed: 24-Mar-2023].

[18] H. Frishberg, "'I had pasta tonight' becomes TikTok code for feeling suicidal," *New York Post*, 01-Jul-2020. [Online]. Available: https://nypost.com/2020/07/01/i-had-pasta-tonight-becomes-tiktok-code-for-feeling-suicidal/. [Accessed: 24-Mar-2023].

LINKS FOR FURTHER READING

https://edu.gcfglobal.org/en/digital-media-literacy/why-we-cant-stop-scrolling/1/

https://nypost.com/2020/07/01/i-had-pasta-tonight-becomes-tiktok-code-for-feeling-suicidal/

https://www.additudemag.com/doom-scrolling-wasting-time-on-social-media-adhd/