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Artificial intelligence and its potential harm through the use of generative adversarial network image filters on TikTok

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Abstract

This study examines the use of Artificial Intelligence (AI) Generative Adversarial Networking (GAN) in TikTok image filters, specifically the Teenage Look and Bold Glamour filters. Through a case study analysis of secondary qualitative material, two research questions were addressed: Do AI GAN filters' use in TikTok facilitate harm on users, and if so, what can be done to counter those harms? The study confirmed that harms to users' self-image and society can exist and provided ways to counter those harms by addressing legislative, technological, and social means.

Keywords: artificial intelligence, generative adversarial networks, TikTok, self-image, bold glamour filter, teenage look filter, body dysmorphic disorder

Introduction

In 2007, the "Smartphone" was born; it was Apple's iPhone. It was introduced as "a wide-screen iPod with touch controls, a phone and an internet communicator" (Merchant, 2017). There were no outside apps even available for download. Other companies and their Smartphone versions would soon follow. From its start, the Smartphone was a sensation and became an indispensable part of Twenty-first Century life. But tempered with all of the Smartphone's utility, comes a cost. Often, that cost comes in the form of harmful and sometimes unforeseen destructive circumstances. Because the Smartphone has become so central to nearly every modern task, it has also often embodied one's sense of self. Who among us has not panicked when we misplace our Smartphone and we're absent the technological pull of our online persona? That disassociated sense of identity can encapsulate all kinds of other personal identification markers as well.

For example, while face-to-face bullying has been around since the dawn of man, another form, cyberbullying, has recently entered the lexicon as a daily destructive issue for many. Self-worth and issues with body image can also often be tied up with this online persona. (Pendergrass & Payne, 2018) Smartphones have introduced numerous apps of Internet-available Social Media sites through the years: Instagram, Facebook, Snapchat, etc. In 2017, ten years after the introduction of the iPhone, the Chinese-owned IT company ByteDance launched their short-video service app known as TikTok. (Zeng, et al., 2021) The app soon found a niche audience with teens at the advent of the COVID-19 pandemic in 2020 which grew and grew. (Klug, et al., 2023) Soon, TikTok became the Schelling Point for social media, the use of visual filters, dance videos as well as evolving news and social commentary. (Allyn, 2023b)

It was soon after its introduction that TikTok filter designers began to experiment with the use of Artificial Intelligence (AI). (Weatherbed & Sato, 2023) One method was the use of Generative Adversarial Network (GAN) designs, which created filters which were so stunningly real and convincing, with no lag time between users' screen movements, that they evoked stark and immediate reactions from users, not always

complementary. (Johnson, 2018; Siedman, 2023) The use of these instantaneously updated, convincingly real beauty filters, such as Teenage Look and Bold Glamour, have suddenly opened the eyes of many to the potential harm and abuse of the incorporation of AI in social media, not only for the individual user's feelings of self-worth and self-image, but for wider social implications in the future. (Allyn, 2023a; Ramos, 2023; Vine, 2023) This phenomenon and its subsequent effects is the focus of this paper; the potential negative effects of these AI GAN filters and their potential for individual and societal harm.

Qualitative Methodology

To examine a modern real-time social online movement such as with TikTok will require sifting through an enormous amount of current evolving data. The anticipated amount of diverse material involved with the subject matter pointed towards a qualitative analysis structure with a broad range of potential elements. The methodology ultimately chosen was that of a Case Study. Yin (2009), the leader in Case Study design, proposed that "case studies are the preferred method [of analysis] when (a) 'how' or 'why' questions are being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context" (Yin, 2009). The study of current Social Media trends such as TikTok, its effect on users' identity and worth and their alignment with AI methods, matched those qualifying descriptives. Yin defined three core principles of Case Study data collection: 1) collect multiple, different sources of evidence, 2) create a database of that collected material, and 3) maintain a chain of evidence. (Yin, 2009) One example of this method Yin offered was a 1929 study which utilized descriptive bins to create the database of collected material, which then allowed the researchers (Lynd & Lynd, 1929) to sort through a huge amount of that collected data more easily.

In their book *Middletown: A Study in Modern American Culture*, Lynd and Lynd (1929) defined a number of unique descriptives so that a large amount of data taken from various sources within a small Midwestern U.S. city could be anonymized to create a general idea of an "average" city's characteristics. The Middletown study's evidence was maintained within custody chains and descriptive analysis bins of similar material for a fully holistic analysis in search of trends of like and dissimilar material to form a response. Likewise, the evidence analyzed in this effort was also collected from a number of diverse secondary sources. Sources included: social media posts, to include TikTok videos, academic studies on AI as applied to videos and social media, news articles and features on the phenomenon taken from Google News searches of Technology, U.S., Science, Health, Business and Entertainment categories and other unrelated sources of data. This evidence was then sorted into like-categorical bins of Artificial Intelligence, TikTok as a phenomenon, use of visual filters, social response to self-awareness and identity depictions, possible social and personal harms done as a result of those depictions, and resultant responses and future effects. These analysis bins were then holistically examined to determine research questions related to the phenomena and ultimately the resultant answers to those questions.

Background

While the Smartphone was introduced to the public in 2007, the issues related to it, both positive and negative, had their roots in earlier Internet and non-Internet behaviors. Negative issues related to Smartphone use include cyberbullying, cybershaming, gamification, and phubbing.

Bullying as a negative social behavior dynamic has continued as a social issue. It was only with the advent of 24 hours a day/7 days a week Internet-enabled connectivity that it became a more constant threat to emotional well-being, especially with more vulnerable communities such as youth. The resultant cyberbullying - bullying using information and communications technologies such as the Internet – has

been shown to be just as detrimental, if not more, than face-to-face confrontations. (Pendergrass & Wright, 2014) This near constant bombardment of cyberbullying threats and hate can be caustic and deadly. Emotional distress, even suicide can result from this vitriolic negativity. Threats can also come as a result of events like cybershaming. **"**Cybershaming is a form of trolling that incorporates the episodic use of cyberbullying to draw out and identify an individual in order to highlight the incorrect behavior or attitude from that of the audience" (Licht, 2016). Cybershaming is a public form of making an example out of someone for their behavior; the effects of which can follow someone years after the initial acts.

Game Theory in Smartphones' use, or Gamification can be another form of negative action related to Smartphone use and abuse, the commodification of the online communicative experience. "[Gamification] is the use of game elements – point scoring, levels, competition with others, measurable evidence of accomplishment, ratings, and rules of play – in non-game contexts" (Mason, 2018). Turning work into games can cause addiction issues, much like traditional gambling activities. This commodification is one of the results of creating an Attention Economy, where one's attention can be monetized and bought and sold to advertisers and others. That constant draw on attention can leave the user oblivious to the world around them and result in phubbing issues in relationships.

Phubbing, a portmanteau of Phone and Snubbing is a term which has been introduced to the modern lexicon since the creation of the Smartphone. While phubbing was a clear threat to relationships at the advent of Smartphone's use, it has become a diminishing one as Smartphone use has become more and more ubiquitous and all members of the family or relationship have their own personal device. Smartphone apps have exponentially multiplied as Smartphones gained more memory and wider use. Legacy connectivity sites like Facebook, Pinterest and such have been eclipsed by apps of an infinite number of topics and interests. It was with TikTok and the 2020's need for connectivity in the midst of the COVID pandemic that short video became more imbedded in the general collective. It was only a matter of time before the use of popular Internet Smartphone apps in a medium with the potential for negative consequences would combine with nascent AI GAN development in visual TikTok filters. Does this combination have the potential for negative effects on its users and if so, how could those effects be diminished? This leads to the Research Questions for this paper.

Research Questions

1. *Do AI GAN filters' use in TikTok facilitate harm on users?*
2. *If so, then what can be done to counter those harms?*

Discussion

In 2017, the Chinese IT company ByteDance acquired the short-video app Musical.ly and combined it with their launch of the Chinese app TikTok the next year. Musical.ly was popular with teenagers in the U.S. and UK since 2014. By merging the two in 2018, ByteDance created a single short-video destination for worldwide access. (Zeng, et al., 2021) TikTok initially allowed users to share short-video content: 15-second, or 1-, 3- or 10-minute-long videos. (Capoot, 2023) "During the early days of shelter-in-place regulations in the U.S., TikTok had a real moment — and the moment maintained itself" (Silva, 2023). TikTok users, or TikTokers, would amass large fanbases by starting viral dances, posting montages of their pets' high jinks and demonstrating the various stupid human tricks, etc. It proved so influential that there was even talk of how it influenced young people into believing they had Tourette's syndrome through obsessing over videos shared by those who actually had the syndrome; as if it was "an example of mass sociogenic illness, which involves behaviors, emotions, or conditions spreading spontaneously through a group" (Olvera, et al., 2021). TikTok had become extremely consequential as a social influencer and as the

Schelling Point for social focus. (Allyn, 2023b) It did this in part through its selection algorithm which steers users' For You Page (FYP) suggestions.

> TikTok's algorithm regularly propels virtual nobodies onto millions of viewers' For You pages. TikTok weighs whether viewers show strong interest in a particular type of content, measured by whether they finish watching videos, the company says. Its recommendation engine then chooses videos to send to those viewers, regardless of the creator's follower count or past video virality. Platforms like Instagram, YouTube and Twitter work differently, serving content to users based on search terms and friend connections, so developing a sizable following—and going viral—on those sites can take longer. (Jargon, 2022)

TikTok is a relatively new phenomenon, so there are limited peer-reviewed research articles about its use and the use of its algorithm. However, there are a few recently conducted TikTok-specific studies, and, as a social media app in general, there are a very large number of more generalized research topics which have been developed. One TikTok-specific research study of the use of the app, focused on how easy it is to lose oneself within it.

> The perception of TikTok's effortlessness, recommendation accuracy, and recommendation serendipity can most likely provide users with a 'flow' experience, which refers to the optimal experience of doing something completely concentrated, generating an intense sense of enjoyment and satisfaction, and focusing intensely on the task without being aware of the time. (Qin, et al., 2023)

Another TikTok-specific study which was conducted on Chinese youth in 2021 found that "TikTok's potential for competitive displacement of other social media apps seemed to be 'time-of-day-specific' with *trendiness* driving daytime use, *novelty* driving nighttime use, and posting TikTok videos being driven by *socially rewarding self-presentations*" (Scherr & Wang, 2021, emphasis in original). A recent Pew Research Center report found that 67 % of 13- to 17-year-olds use TikTok, and 16 % said they use the app "almost constantly" with 36 % of them recognizing they spend too much time on social platforms in general (Karuppasamy, 2023). TikTok's algorithm's success is measureable; in time spent on the app, in revenue dollars generated, and such. It has been so successful; it has morphed all into social media's "new normal."

> The big social apps now feel <u>increasingly the same</u> because they're filled with the same stuff: content their users didn't ask for made by people they don't know on platforms they may not even use. Where they used to see posts from people they know, now there are algorithmically suggested videos from *somebody* made for *nobody*. (Herrman, 2023, emphasis in original)

TikTok Filters

As primarily a visual medium, TikTok early on relied on using visual filters to add variety to users' posts. These filters started out as crude comical pastes onto visual content. For example, filters consisted of adding dog ears and a panting snout to a user's face, adding a hat and jewelry, wigs, makeup, exaggerated features, etc. These filters were taken as they were meant to be taken, obvious exaggerations for the sake of the video content. But more and more, the filters were being refined into much more convincing applications of enhancement and as the software improved, so did the quality of the image support. Eventually, they would reach a tipping point of being so good one couldn't tell if a filter was being applied or not; AI had become a factor in short-video image-filter design.

The "Teenage Look" Filter

One of the first striking AI visual filters was introduced in February 2023 and quickly had users obsessed; it was dubbed the "Teenage Look" filter. (Hurler, 2023) It would allow the user to show a "before and after" type visual comparison where the user's true visage was displayed side-by-side with a younger version of what could only be called a younger teenage version of the face. Often this was shown with a clip of Alphaville's song "Forever Young" released in 1984, playing in the background. "In one video with more than 15.8 million views, a middle-aged (or possibly younger) woman tearfully greets her teenage self. The top comment, with more than 30,000 likes, reads 'I don't want to grow old' followed by three crying emoji" (Tait, 2023). The reactions posted with the videos were real, they were emotional and extremely relatable. They were also noteworthy because the filter was not readily accessible in the U.S.; these reactions initially came from users in the UK, Europe, and Australia. The reactions touched a nerve with a specific demographic of TikTok users, older Gen X users who could see themselves as in a younger and simpler time. The change also did not work with younger users as convincingly, if at all, so eventually videos of parents and their children, all appearing the same age would be posted for viewing, comments and sharing.

The "Bold Glamour" Filter

At nearly the same time, videos of women of striking beauty appeared on TikTok. These videos would show the users' amazement at how good they looked. There were often the users trying to show the filter blinking on or off as they waved hands in front of their faces. But the filter did not hesitate, and the image was fully present as long as the user enabled it. The filter was called "Bold Glamour" and reactions to this filter were immediate and intense. (Hurler, 2023; Kornik, 2023)

> "I don't wanna [sic] be known as the tiktok [sic] filter guy, but ICYMI [sic] after attacking GenX w [sic] teenage filter, tiktok [sic] just dropped a new filter to take out Millennials & GenZ. 'Beauty filters' are not new, but the precision on this is beyond uncanny. This is psychological warfare & pure evil," [Computational artist, Memo Akten] tweeted. (Kornik, 2023)

> It is not subtle. It is instantaneous. It is powerful. And when people who desire social approval and positive feedback start to use it, they will not like what they see. Or rather, they won't like what they see when they turn the filter off, and that's the problem. (Siedman, 2023)

The filter was certifiably viral almost immediately and as of March 9th had been used in more than 9 million videos and the #BoldGlamour tag having more than 355 million views. (TikTok, 2023; Roberts, 2023; Weatherbed & Sato, 2023) As it turned out, the strength of the visual effectiveness and its allure was the fact that it was a new type of TikTok filter, one that used Artificial Intelligence at its core. That Artificial Intelligence technique is known as Generative Adversarial Networking (GAN).

Artificial Intelligence Generative Adversarial Networks

GAN is a method of using a conflict between two computing models to create a third one. (Johnson, 2018; Karras, et al., 2019) The first model generates whatever you want it to generate; that could be in the form of a face, a letter, a number, etc. The second model tries to decide whether it believes the generated image is real or not. If the discriminating model succeeds in identifying the generating model's creation, then the generating model goes back to the drawing board. It iterates and tries again. The adversarial nature of the

paired computer models causes a creative arms race, constantly driving the generative half toward more convincing forgeries. (Ward, 2022)

Over time, more and more efficient GAN architectures have been designed and proposed to learn the different variations of faces, such as cross pose, age, expression, and style. (Kammoun, et al., 2022) GAN will pit two competing AI visions against each other to create the third one. In the case of the Bold Glamour and Teenage Look filters there is competition between what the camera sees as your face and what the TikTok filter wants to morph it into. "Because it uses [your camera image], it then compares aspects of your face to a dataset of images that start to match against your cheeks, eyes, eyebrows, lips, and more" (Weatherbed & Sato, 2023). Rapidly and eventually, technology combines the two sets of images into one image. In principle, if it is done quickly enough, it will be imperceptivity refreshed and achieve a video-level framerate. This creation of video-level GANs is more complex than photo-level ones because of the amount of data and the addition of the dimension of time. (Aldausari, et al., 2022) The almost instantaneous refresh rate is what gives the appearance of flawless updates which are imperceptible to the critical eye. The starting model is almost inconsequential to the GAN refreshment final concept, which becomes that which is recognized. (Goodfellow, et al., 2014)

The question then is, so what? So TikTok has another visual filter, what's the harm in that? While it may not be changing your face to add a pig's nose, or donkey ears, what's the harm in an AI GAN visual filter with an instantaneous refresh rate that makes it almost impossible to recognize? Well, potential self-image harms, tied to Smartphone social media personalization are the subsequent concerns.

Potential AI GAN Harms

A direct link between social media posting and harms of higher body dissatisfaction and eating disorders has been established in the literature. (Fardouly & Vartanian, 2016; Harriger, et al., 2023; Saiphoo & Vahedi, 2019) It has also been found that participation in appearance-based activities, like posting videos or commenting on others' posts, are also related to body dissatisfaction. (Fardouly & Vartanian, 2016; Holland & Tiggemann, 2016; Saiphoo & Vahedi, 2019; Vandenbosch, et al., 2022) What can these harms do to the individual users and society as a whole when the distortion is so good and what does this mean for those who might want to manipulate that distortion or for future trends of associative technology?

Harm to Self-Image – Mental Effects

One of the most striking features of these AI GAN TikTok filters is just how convincing they are. The initial reactions from nearly every user commented on how profound and affecting the change was and how they immediately recognized the inherent danger in such a realistic representation it was. A filter, as apparently image-identity altering as Bold Glamour, can profoundly affect those who obsess over it. It can especially affect those having preexisting and underlying self-image issues. These types of issues are even more affecting for someone who is still forming their own self-identity; youth to be precise. Even before the filter works, TikTok itself adapts the imagery of the user.

> TikTok, like most of social media, creates a feedback loop, though perhaps even more perniciously. From the moment a user clicks 'record' on a video, their face is instantly touched-up before a filter option is even available. The 'you' one sees on TikTok is the 'you' of one's imagination (i.e. with a slightly smaller nose or clearer skin). Choose from one of their myriad filters and you are further transformed with elaborate make-up, bigger eyes, bigger lips — the menu is infinite. (Dee, 2022)

But there is evidence, even before TikTok, that the repetitive use of altered self-images posted on social media to others can have repeatedly detrimental effects. In one of the first studies to demonstrate a direct correlation between taking and posting selfies on social media and adverse psychological effects, women reported feeling more anxious, less confident, and less physically attractive afterwards compared to those in the control group. "Harmful effects of selfies were found even when participants could retake and retouch their selfies" (Mills, et al., 2018). One study (Gill, 2021) into the social impacts of filters by University of London researchers found that 94 % of female and non-binary participants felt pressured to look a particular way, while 90 % admitted to using filters or otherwise editing their images.

Another study from 2017 (Nightingale, et al.) by the Cognitive Research Journal found that people only recognize when an image is manipulated around 60 to 70 % of the time. (Weatherbed & Sato, 2023) Researchers also found that the use of selfies without makeup as compared to those showing idealized made-up images might reduce any negative impact on women's facial concerns. (Fardouly & Rapee, 2019) Research done by the Dove Self-Esteem Project, showed that 80 % of girls have used a filter to change the way they look in photos by the age of 13, and as a result, 48 % of girls who distort their photos regularly have lower body esteem compared to 28 % of girls who don't. (Dove, 2023). For those who post online, especially young people, either with altered or unaltered videos and selfies, there is an inherent draw to check and recheck their online presence. Digital connectivity can be like a constant metronome of concern. Even if their screen time is positive, they've developed a hyper-awareness of how they're being perceived online. They're always on, always being watched and judged. "A lot of kids view themselves as a brand, and they focus on that brand and how they're presenting themselves to others. That's a lot of pressure. That's a lot of stress 24/7" (Ruiz, 2023).

Harm to Self-Image – Physical Effects

On TikTok, the sheer volume of people that every user is exposed to is bound to have a desensitizing effect in which every person (especially women and girls) is reduced down to their looks. (Dee, 2022) Hours spent scrolling through one's FYP contacts' content reinforces the imagery fed into the users' mind. Even when the images are not of real people, they unconsciously reinforce the beauty misperceptions. The problem is not confined only to TikTok; other social media companies have been found to be culpable in their use of algorithms to target individuals at risk for body image issues. (Harriger, et al., 2022) These filtered images which can blur the line between reality and fantasy could actually be triggering Body Dysmorphic Disorder (BDD), a "mental health condition where people become fixated on imagined defects in their appearance" (Rajanala, et al., 2018). This can cause users to seek out invasive cosmetic procedures such as Botox injections, lip fillers or even more drastic surgical measures to try to obtain the illusion portrayed in the filters. (Clarke, et al., 2023)

Studies have also suggested that this manipulation coupled with concerns about images posted may be risk correlates for BDD in both women *and* men. (Lonergana, et al., 2018, emphasis added) One of the biggest problems with many of these social media filters is that in actuality they are physically, surgically unrealistic, and unobtainable.

> "The first thing that any of these filters do is give you a beautiful complexion," says [plastic surgeon Dr. Wassim Taktouk]. "Your naso-labial [laugh] lines, from the nose to mouth, aren't existent – but that's not a human face. No one doesn't have those. You can see them in children." Clients still request their removal, and of "the tear trough" – the groove down from the inner corners of the eyes. "People wanting bigger eyes is another one – it's just not possible." (Hunt, 2019)

The rush towards the "more perfect you" even when unobtainable, can be devastating when the image in one's mind will never match the image possible in reality. This endless loop of anticipation, expectation and disappointment can have devastating cumulative effects on self-image. To be clear, TikTok AI GAN filters did not start this problem, but they certainly do not solve it.

Harm to Society – Social Trust Effects

Social Trust is grounded on the assumption that essentially "what you see is what you get." Believability on the part of both parties will often ease assumption of the validity of the other's argument. Faces generated by AI GAN are realistic-looking faces, but they are essentially people who do not exist. Even so, they are increasingly being used in marketing, journalism, social media, and political propaganda. (Tucciarelli, et al., 2022) Some question whether common social media terms of use are even correct in these circumstances; the convincing totality of the experience shies away from the validity of the term "filter" and veers more towards that of a "significant altering of an image, more like what we see in cinema" (Meyer, 2023). Believability as a concept is genetically hard-wired into our social interactions. A recent study found that people will quickly make value and trustworthiness judgments just from another's facial appearance. (Todorov, et al., 2009) This concept also relates to the believability of the idea of face-value. "The mental representation of abstract ideas is quite similar to the mental representation of physical objects: People believe in the ideas they comprehend, as quickly and automatically as they believe in the objects they see." (Gilbert, 1991). Generally, we tend to operate on a default assumption that others are basically truthful and trustworthy. "The rise in our awareness of artificial online content raises the question of how much their presence and our knowledge about [the artificiality] can alter this 'truth default' state, eventually eroding social trust" (Tsarkiris, 2023).

Harm to Society – Predatory Risk Effects

These TikTok filters can presently only be used with the filter identified as "on" however this is an easy switch to flip "off." In the future, these AI-generated filters will make their way to other sites, in other uses and create additional issues. Vulnerable groups such as underage users could find themselves more targeted by predatory groups who use the filters to camouflage themselves and their intent. Consider the use of the Teenage Look filter for age-impersonation and the use of the Bold Glamour filter for beauty-attention. There are definite dangers associated with putting a teenage filter onto an adult's face. By passing themselves off as a teenager either through the use of the filter or by incorporating it into other means of communication and coercion, a predator can more easily blend in with the group. This might help someone suspend the normal aversion to meeting a stranger when they've supposedly seen their face and talked with them. "'[The Teenage Look filter] seems dangerous,' [body confidence influencer Danae Mercer Ricci] wrote. 'Like it would make it easier for online predators to impersonate children'" (Biggs, 2023).

At the other end of the spectrum, teenagers who want to use the Bold Glamour filter to transform themselves into an image that they want to portray to others, might increase their risk of hyper-sexualizing themselves on the platform.

> Mental-health professionals around the country are growing increasingly concerned about the effects on teen girls of posting sexualized TikTok videos. Therapists say teens who lack a group of close friends, and teens with underlying mental health issues—especially girls who struggle with disordered eating and body-image issues—are at particular risk. (Jargon, 2022) None of this is to say that women - or young girls - deserve to be the subject of unwanted or inappropriate sexual comments - they don't. Nobody does. But in 2022, we still don't know what to say about the role of male validation in women's lives. All that

> remains is a series of conflicting messages, simultaneously telling young women that they don't need it and yet that it's empowering to receive it. (Dee, 2022)

Harm to Society – Technology Creep Risk Effects

Another form of video manipulation which could be augmented by the use of AI GAN technology are deepfake videos. The use of the term "deepfake" began in 2017 when a Reddit user with the handle "Deepfakes" started uploading modified pornographic videos ostensibly featuring well-known celebrities. (Ward, 2022) It could be considered the next step of the established practice of photoshopping celebrity faces onto still-pornographic images; now applied to videos. When the process first started, each short video clip took weeks of editing work. Over time, by using open-source algorithms as well as established video editing tools, the videos got more and more convincing. (Vincent, 2021) This manner of use could conceivably be applied to AI GAN technologies, if it hasn't been already. With those algorithms in place, it could be done faster and easier. Deepfakes are not limited to professional or amateur pornography, it could be used for "revenge porn"; the use of deepfake videos with any individual's likeness superimposed.

> [Revenge porn] takes a well-documented toll on victims. In some cases, they've had to change their names. In others, they've had to completely remove themselves from the internet. They constantly fear being retraumatized, because at any moment the images could resurface and once again ruin their lives. (Hao, 2021)

Deepfakes have also been used politically in election ads and spoofs on a variety of social media platforms. For example, in the lead-up to the 2020 U.S. presidential elections, "increasingly convincing deepfake technology led to fears about how faked media could influence political opinion" (Hao, 2019). But while there were no known instances in which deepfakes were actually used in concerted disinformation campaigns in that election cycle, the more troubling takeaway was the knowledge that they *might* have been used in that way. That is the real damage done to the collective body politic and their trust in the system. As recently as this year, "a fake video emerged on Facebook and YouTube in which a strangely motionless version of [Ukrainian President] Zelensky asked Ukrainian troops to lay down their weapons" (Sansar, 2023). The deepfake was obvious but its use coupled with the rise in AI technology sophistication means it can only get better and more hard-to-detect. The technology is not only confined to nation-state use; anyone can manipulate deepfake videos with enough intent and technological means and know-how. Recently, "three high school students just north of New York City posted videos on TikTok that appeared to show a nearby middle school principal and a member of law enforcement making virulently violent and racist remarks about Black students" (Gilbert, 2023). The technology is in place for any number of uses, not all of them good. "The rapid advances in generative AI may prove dangerous in an era when social media has been weaponized and deepfakes are propagandists' playthings" (Knight, 2023).

Countering Harms

Given the potential harms outlined above of AI GAN filter use in TikTok and beyond (Research Question 1), there are a number of avenues for addressing the issue detailed below (Research Question 2): technologically, legislatively, and socially. Some of these methods call for external forces to act while others require internal awareness of the harm.

Legislatively

On the surface, legislative action might appear to be an effective way to singlehandedly counter societal ills, but the hammer often is too big for the nail and/or unexpected consequences appear which make the

fix worse than the issue to begin with. For example, some countries have tried implementing advertising disclaimer laws on potentially deceptive imagery to dissuade body-image dissatisfaction, however that has not been proven to be effective. (Sharp & Gerrard, 2022) On the contrary, there is research that suggests that the use of disclaimers not only fails to reduce dissatisfaction, but it may lead to an *increase* in social comparisons. (Danthinne, et al., 2020, emphasis added) In 2019, the Peterson Institute for International Economics noted China's rise in the social media environment through TikTok and that risk to the West. Their study remarked that "innocuous-looking apps like TikTok could be among the Trojan horses of the AI race—China should not be allowed to wheel them around the world while killing competition at home" (Biancotti, 2019). The rise of TikTok through the COVID-19 Pandemic and China's potential for data mining came to a head in 2023 when U.S. Congressional committees noted the risk to Americans' data and information. FBI Director Christopher Wray said of TikTok that "this is a tool that is ultimately within the control of the Chinese government - and it, to me, it screams out with national security concerns" (Martina & Zengerle, 2023). The U.S. subsequently joined several countries banning TikTok apps from government-owned platforms but actions to ban its use entirely have stalled. Legislative action is likely too broad and slow a tool to be surgically effective.

Technologically

The easy technological fix would be for TikTok to eliminate the offending filters from its repertoire, but that is rarely an effective answer. Given the exponential expanse of AI technology, including GAN techniques, the genie is out of the bottle. While there are ways to flag the filter: self-identification, installing digital markers or any other number of marking/identification tools to show the technology is in use; there are and will always be ways to get around any limitations and markers. (Lichfield, 2023; Shan, et al., 2023) Currently, AI GAN's filter veracity is assisted by TikTok's video-sharing time limitations; shorter videos require less computing assistance. (Hoover, 2023) While that computing limitation currently factors in, who is to say that it will hold for long? Alan Turing famously proposed a test where if a machine can engage in a conversation with a human without being detected as a machine, it has essentially demonstrated human-equivalent intelligence. Could the same analogy be adapted when presenting visually as a specific version/vision of another person? We are fast approaching that blurred line and in some ways are perhaps even past it. A technological solution, while currently achievable, is perhaps the easiest to become irrelevant.

Social - Externally

Social awareness activism is a broad tool to collectively address all sorts of ills. One example, the body positive movement, began in order to challenge accepted ideals regarding appearance and to encourage body acceptance by all, irrespective of body size or shape. This all-encompassing awareness has been embraced by social media in addition to other more traditional forms of media. For example, in 2019, Instagram recognized the harm some of its filters were doing to young women and consequentially pulled some of them from its platform. Filters mimicking facial surgery, such as "Plastica" and "Fix Me" while popular, were removed. (Scott, 2019) There continues to be a call for social media influencers to disavow their use of filters to enhance their appearance despite their brands' encouragement of it. (Schein, 2021) In 2021, the UK's Advertising Standards Authority agreed that the use of filters in the promotion of certain cosmetic products or claims by influencers could not go unchallenged. (Pallari, 2021) The international cosmetic company Dove created a campaign to counter the influence it saw AI GAN image filters such as Bold Glamour were being given. It encouraged its users to turn their backs on filters such as the Bold Glamour filter and post TikTok videos using the hashtags, #TurnYourBack #BoldGlamour #NoDigitalDistortion. (Ormesher, 2023) In addition to external social awareness comes external social relevance. TikTok is a brand and is only as popular as it's perceived to be. The history of social media is

littered with the remnants of "the next best app": Myspace, Friendster, Facebook, Vine, etc. That social relevance is directly applicable to "network effects." (Allyn, 2023b) As long as it is useful and sometimes more importantly "hip," then it is relevant. Both the market and public dictate whether not only filters, but the platform itself will withstand the march of time and relevance.

Social - Internally

Perhaps the hardest, but ultimately most effective way to combat social dysmorphic trends is with self-awareness of one's surroundings and limitations. Some of these recognize the technological distortions inherent in modeling and others recognize the mental biases inherent in the self. First is to recognize there are issues with faithful reproductions/representations given the technology of smartphones and apps. Photographs of one's nose, taken at shorter, arm length distances will increase "the perceived ratio of nasal breadth to bizygomatic breadth" (Ward, et al., 2018). Smartphone camera images of one's nose do not accurately reflect the 3-dimensional appearance of the nose. Faces are flattened and distorted from real life. Smartphone cameras inherently use a flipped image – not what you see, what others see – which might seem foreign and strange to the person taking the selfie. (Rivers, 2021) This adds to the starting distortions in the perceived faithful representative imagery. Cameras and lenses of different phones matter as well. "Non-filtered selfies are flipped, front cameras produce different results from back cameras, and there are even marked differences between models of phone" (Hunt, 2019). Revolts against TikTok algorithm addiction and FYP screen flipping have led some to put their smartphone aside and go back to non-smartphone use to get away from screen time addiction issues. (Mays, 2023) The good thing to consider is that so much of the distortion inherent in social media gets filtered out almost unconsciously by the users these days; users have become savvier even as the platforms have become more sophisticated. However, sometimes the best help comes from the support of others. Sometimes, receiving trusted information and supporting affirmation from one's peers and friends is the most powerful tool available. (Tiggemann & Velissaris, 2020) The old axiom does hold true - if it seems to be too good to be true - it usually is. Don't believe everything you see.

Conclusions

In February 2023, AI GAN-generated TikTok visual filters elicited noted emotional reactions from many. The Teenage Look filter brought feelings of nostalgia and time lost. Almost immediately after that, the Bold Glamour filter elicited shock in most. There was of course the shock of how the filter changed one's appearance, but there was more, the shock at how invasive the filter *felt.* This visceral reaction caused many searches to find out why these were different from previous TikTok filters which made obvious visual alterations. Artificial Intelligence and Generative Adversarial Networks have now entered the vocabulary of social media use and abuse. This became an inflection point for many who saw this as AI's intrusion into their daily life in a way they had not realized was possible. Many saw the novelty; others saw the danger. A danger that marked a point where AI was no longer a science fiction concept only but a part of daily and future life.

This paper sought to address two questions: 1) Do AI GAN filters' use in TikTok facilitate harm on users, and 2) if so, then what can be done to counter those harms? Research has shown that given unaware and vulnerable populations, AI GAN TikTok filters *can* contribute to self-image distortion predilections of that population and potentially cause real harm. Additionally, it's also been shown that there are a number of things that can be addressed to counter those harms, some potentially effective and some less so to degrees. The bottom line is that AI is increasingly a part of modern life and will only grow in importance and intrusiveness over time. The best one can do is to accept this reality and recognize when it takes place. As in everything, be alert and aware of all that's around you.

Further Research

Research into body-image dysmorphic-harm and social media use in women and girls is fairly extensive, however there are other groups which might benefit from additional analysis: boys and men. AI GAN, used as a filter in social media apps' visual identification is a very recent development and one that bears further research as to its continued effects on users and observers. While this study was focused entirely on secondary source data in a qualitative analysis, the subject also would provide quantitative and mixed-method researchers with an evolving and prescient subject for study.

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