



TikTok's Non-Inclusive Beauty Algorithm & Why We Should Care

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Introduction

This project will be a meta-analysis of how the popular social media app known as TikTok takes into account image recognition in their machine learning algorithms through the data it analyzes from its users. It will also see how it identifies and pushes the most beautiful to fame and virality. Though we don't have access to the actual TikTok algorithm, we are going to use a very similar dataset known as SCUT-FBP5500. We will analyze how it perpetuates toxic western and eastern beauty standards that are only based on far too simple analyses of what is considered beautiful. We will also use a separate study through a scientific study, which analyzes men and women stimulus in response to beauty. We will lastly use an article, which explores the Chinese app called Alipay, and how it uses beauty filters that perpetuate patriarchal ideals over women. This dataset, study, and article will uncover how human nature and sociology can contribute to how algorithms are truly being fed our want to see idealistic beauty. They will also prove how the belief that the algorithm is inherently bad is false, but that human society around the world needs new establishments of what true beauty is instead. Overall, the goal of this project is to understand these examples of beauty algorithms, how they work, the reason they are used in human society, and how we can improve or discourage use of them in our social media apps.

Background

The history of TikTok goes far back to the app's owner known as Bytedance, and its history of being originally two apps, Musical.ly and Douyin. Bytedance is a Beijing based internet and technology company, which has a long history of accusations of taking user data and allegedly spying on other countries. It also made the United States even open a national security investigation on the company and app. These accusations are for another report, but it can contribute to our understanding of how TikTok uses the data its users give to it. Musical.ly was a video-based app very similar to TikTok, which mainly focused on dancing videos. Douyin was an app based in China, which is the Chinese name for TikTok, that was known for being much more product based. This means it uses visuals through its uploaded videos, where users could buy seen products in those videos, or plan to even go to the specific location of those videos with coupons provided through the app. In short, the decline in Musical.ly and Douyin for a couple of years before their official merge in August of 2018 led Bytedance to become one of the most renowned companies, having its net worth sit around \$100 billion US dollars.

We will be mainly evaluating the two studies provided by Semantic Scholar. One will be with the SCUT-FBP5500 machine learning dataset provided by the South China University of Technology, and the other with a visual activity study provided by Dr. Daniel Gill of University of Winchester. The last study we will reference is through a political and cultural lens from Altman Yuzhu Peng, who looks into the Chinese app Alipay. Peng explains how beauty rating technology that takes data from users is socially harmful. We will also see how this affects eastern cultures surrounding beauty in the economic sense with hiring those based on looks, and how it has even caused a drastic raise in plastic surgery. We will be addressing the main issues of apps like TikTok relying on beauty-based machine learning algorithms through understanding how algorithms and datasets that are similar to TikTok's operate. These issues include how the damaging use of algorithms using incomplete datasets fails to push minority people to fame. We will also see how it also pushes toxic standards of western and eastern beauty, all while destroying the youths' self image and expectations of what it means to be beautiful around the world.

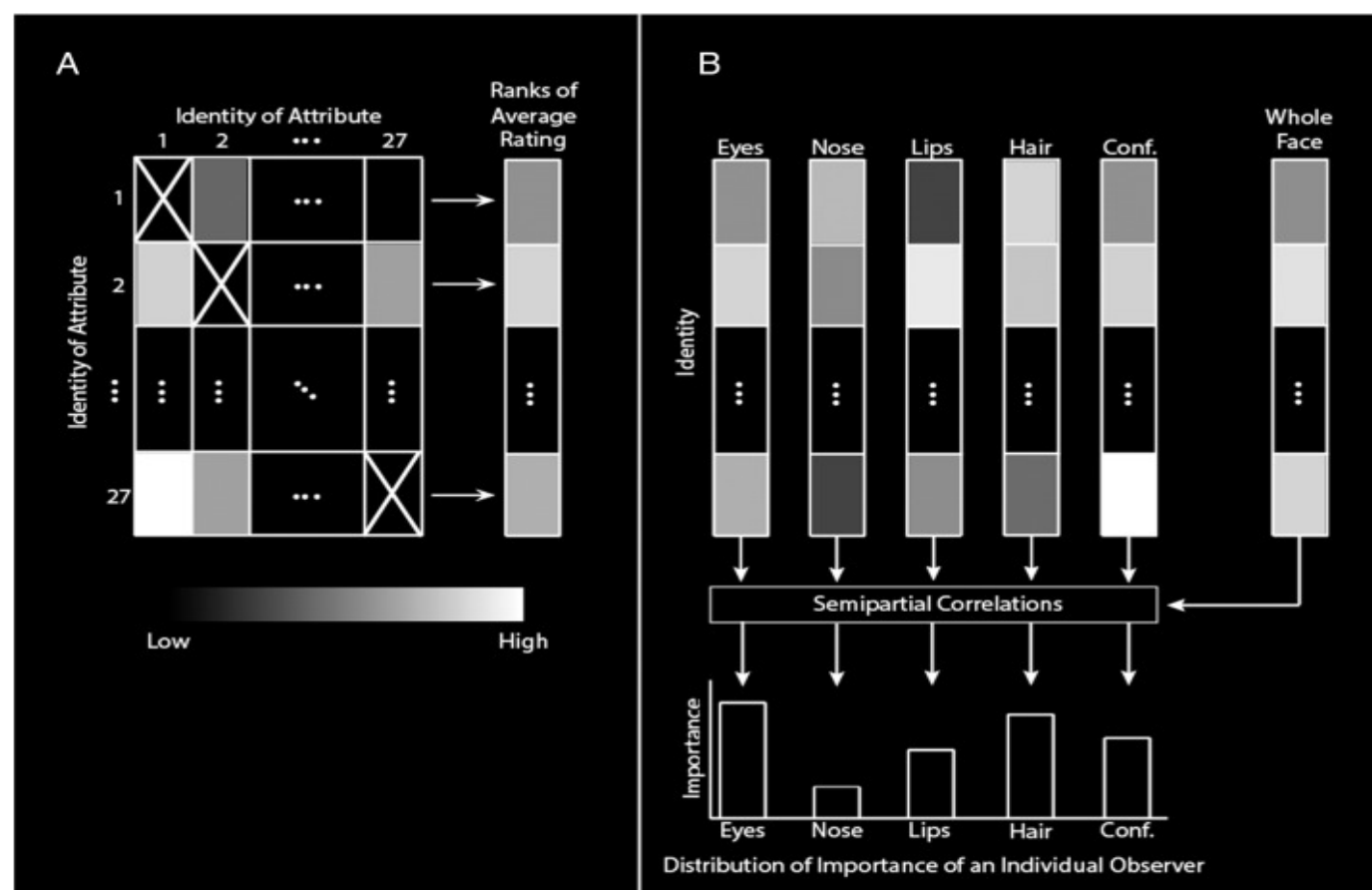
Methodology

TABLE I
REPRESENTATIVE DATABASES FOR FACIAL BEAUTY PREDICTION

Database	Image Num.	Labelers/Image	Beauty Class	Face Property	Face Landmarks	Publicly Available
Y. Eisenthal et al. [15]	184	28 or 18	7	Caucasian Female	x	x
F. Chen et al. [22]	23412	unknown	2	Asian Male/Female	✓	x
H. Gunes et al. [35]	215	46	10	Female	✓	x
J. Fan et al. [23]	432	30	7	Generated Female	✓	x
M. Redi et al. [34]	10141	78-549	10	Multiple (Sampled from AVA [16])	x	✓
SCUT-FBP [1]	500	70	5	Asian Female	✓	✓
SCUT-FBP5500	5500	60	5	Asian/Caucasian; Male/Female	✓	✓

The SCUT-FBP5500 machine learning dataset analysis from the South China University of Technology was mainly centered around creating a new and improved dataset that is based on calculating through a beauty score model. This particular new dataset, called SCUT-FBP5500, used 5500 faces with diverse properties and labels, meaning the machine looked where facial features were placed on the faces between caucasian and asian males and females. Table one explains multiple different datasets and compares them to SCUT-FBP5500, where it succeeds compared to all of them in reading facial recognition technology, as seen in the figure above. The authors, Lingyu Liang, LuoJun Lin, Lianwen Jin*, Duorui Xie and Mengru Li, of the new dataset's creation relied on hand-crafting new features derived from visual recognition. This included the geometric features involving geometric ratios and landmark distances of face, nose, eyes, lips, forehead size and much more. It also checked for textured faces, decoloration, signs of aging like defined lines, and the depth of each face due to bone, muscle, and fat structure. With the data collection of all these facial features, the authors then evaluated their own hand-crafted versions of the most to least beautiful faces on a 1-5 "beauty scale". The goal of making this new and improved beauty dataset was to include more diversity of faces, though diversity as we will later see in the Alipay analysis is far from completed for an app as big as TikTok.

The visual activity study conducted by Dr. Daniel Gill takes a very similar approach, methodology wise, to analyzing faces. He also used beauty scores and a greyscale, as seen in the figure below, which analyzed the contrasts in the face. This looked at mainly the nose, lips, hair, eyes, the whole face, and facial configuration, or otherwise in a greyscale. This particular study used a visual activity analysis to determine caucasian faces only, mainly observing only if the observers could identify biological sex based off just the face, and if based off just facial attributes if a face is truly beautiful. The visual activity had sixty-four observers, which were given various separate images of the facial features listed above separately and were asked to rate each image separately. Some of the results concluded that the differences in how women and men rated parts of the face, such as how women placed more importance on lips, while men placed more importance on eyes. Relating this with our last article we will mention in the next section, we will see how this analysis still has many problems, culturally and socially in western societies, and relating it all to TikTok's beauty algorithm.



Analysis

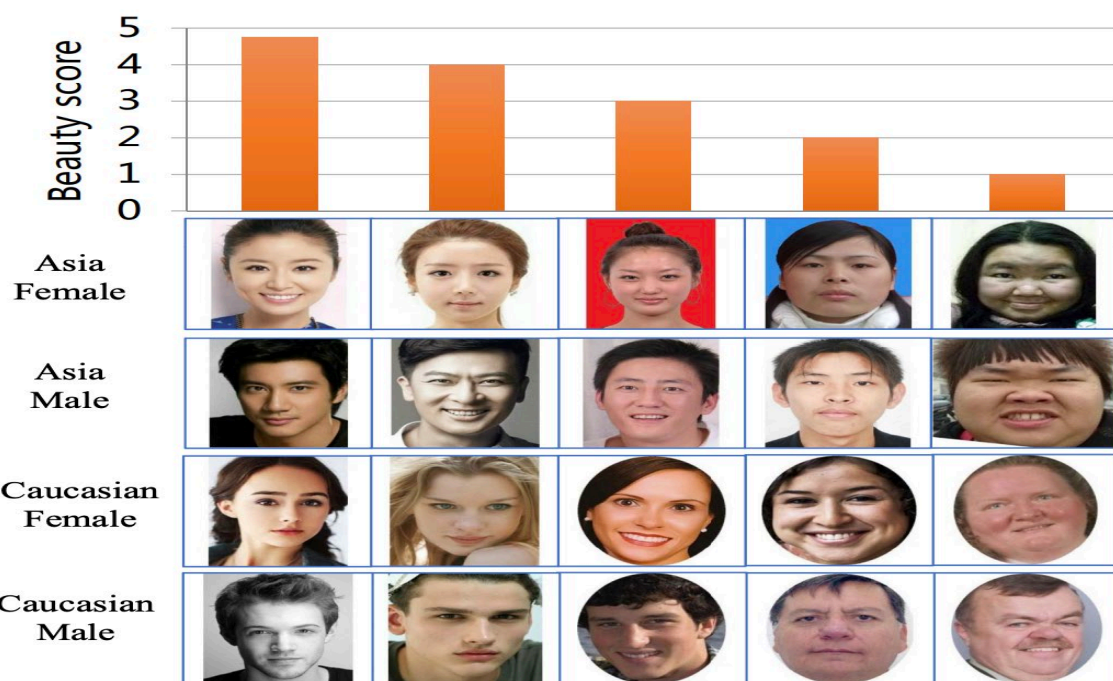
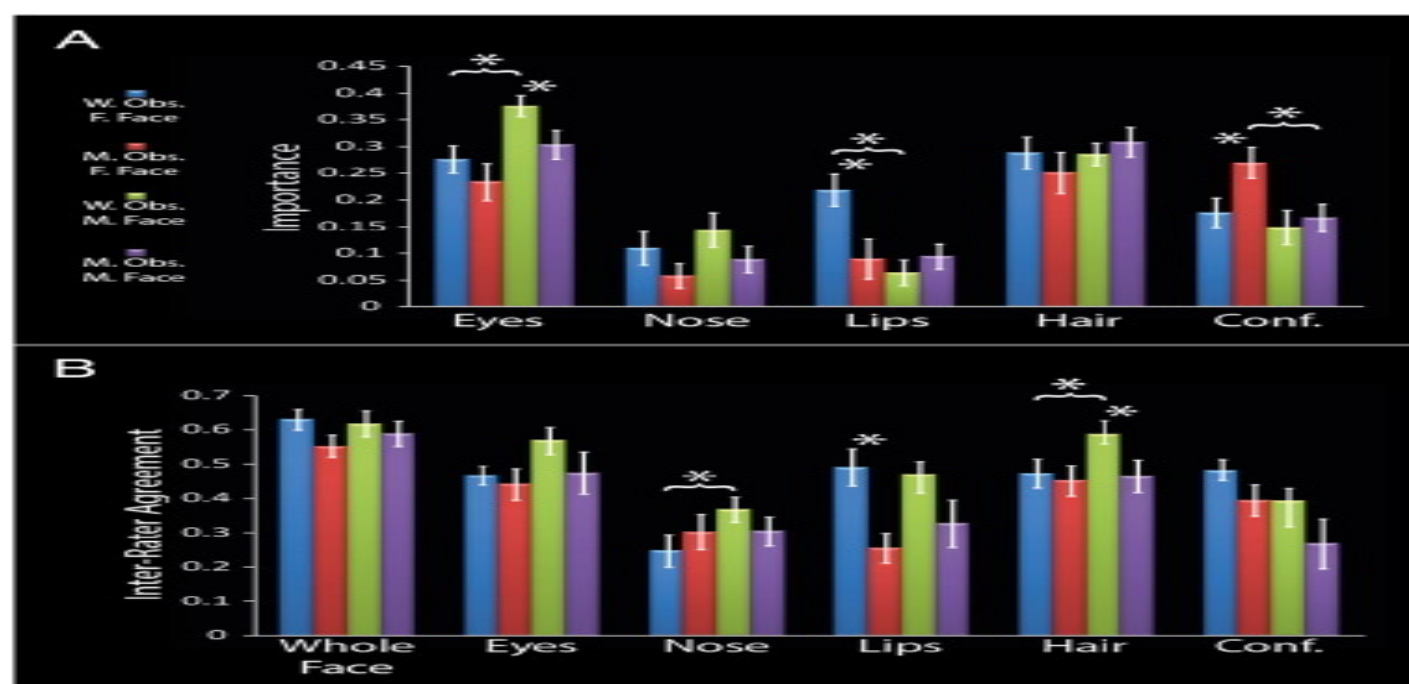


Fig. 1. The images with different facial properties and beauty scores from the proposed SCUT-FBP5500 benchmark dataset. The dataset download URL is shown below the title.

We will be expanding on these stated issues with comparing them to a more direct article on specific societal and cultural issues. The article in question is by Altman Yuzhu Peng, who explored a payment and wallet app called Alipay. This successful app in China introduced face filters in 2019, which saw a dramatic increase in use by the women especially in the way the filters beautify female faces. These filters smooth out the face and lighten it, but they are also known to change the face shape to be rounder and softer, while also enlarging the eyes and shrinking the nose. The design behind these filters were orchestrated by mainly male engineers, further upholding male-dominated patriarchal capitalism that is so prominent in Chinese socio-economic infrastructure. These patriarchal capitalist values persist in eastern technology, making it all the more noticeable how social standards of beauty over women in technology promote the use of the app even more. This ultimately attracts male and female consumers to this false narrative of beauty.

The target to promote the perfect appearance of what women should strive for and look up to can be related to the South China University of Technology dataset we mentioned before. Looking at the above image, the ideal women in asian and caucasian with the highest beauty scores center around highly edited faces of women; meaning they had very rounded faces, large eyes and more. The limitations of datasets set in place by limited examples proved by the male engineers is a stark problem in eastern societies in general, culturally and politically. We are seeing more and more that people in eastern countries are relying on technology to show the best images of themselves, which creates a narrative that the beauty provided by the technology can be mistaken as real. This hurts and promotes the cultural stigmas that women have to go through in order to be deemed beautiful, including how we see many eastern cultures, especially in South Korea, rely on plastic surgery to obtain unnatural beauty standards provided by technology. In the Cosmetic Surgery and Self-esteem in South Korea: A Systematic Review and Meta-analysis study by Sanghoo Yoon I and Young A., we see how this beauty technology is so relied on with social networking for jobs, that many women and men have decreased self esteem, forcing them to get surgery for better job opportunities. When consumers and job recruiters expect more and more of their employees to look like the examples given to them by beauty standards set by datasets like SCUT-FBP5500, there is room for discrimination in peoples appearance, including skin color, skin conditions, physical deformities, and many more attributes that many can't control without facial filters. Now looking at the Gill study, we see that the image on the bottom used limitations in determining beauty.



Analysis

Though this study was more focused on how western caucasian women and men viewed each part of the face on a beauty scale, there were still patriarchal and toxic beauty opinions that showed through in this study. These opinions were seen to be much more critical of features like the nose, eyes, and lips based on how critical western beauty standards are in similarities to eastern beauty standards seen in the Alipay analysis. The Alipay analysis was much more focused on shrinking the nose and adjusting the face in general based on patriarchal views in eastern societies. Both western and eastern societies are concluded to rely heavily on technological datasets to put a set-in stone beauty standards that go off preexisting discriminations and assumptions that hate against people who do not fit the pre established facial features that one should have for reaching fame or obtaining well-paying jobs.

Conclusion

Through all of these examples of datasets and studies relating to how the app TikTok operates based on beauty, we can determine that there are clear issues in how TikTok's beauty algorithm operates. Though with all of these analyses used in the examples given, we must conclude on the bigger issue at hand. We have been able to see how each of these examples use data obtained from real humans to determine beauty. Linking these issues back to TikTok, and its parent company, Bytedance, there is a much more pressing issue over just the visible issues with social media apps relying heavily on beauty to push virality. In other words, we must conclude how these issues persist in this societal age of technology. With how Bytedance controls TikTok's beauty algorithm compared to the dataset we analyzed before; we can see how this company intentionally thrives off user data that we feed to it. Since western and eastern standards of beauty are highly sought after in social media, we are really feeding the app our own toxic ideals of beauty. These ideals involve unrealistic expectations of proportions on the face, like we saw in the Gill study, and how these expectations are pushed through face filters, like how we saw through the Alipay article. The further social and cultural issues are also brought forth with how these studies also do not include people of color, facial irregularities, and physical deformities, and not taking their standards into consideration. We can link these studies with TikTok's algorithm based on the sheer amount of caucasian and asian viral sensations like Charlie D'Amelio and Chen He that have many sought after facial features listed before. A potential solution to these issues surrounding social media apps like TikTok in our society is to not destroy the algorithm, but to make the algorithms more inclusive by providing it new inclusive data provided by many racially different engineers. We must work further towards promoting other aspects of beauty that can be provided throughout the world, which is reachable due to how large the TikTok app is. Though this solution will be hard to reach due to many cultural aspects and differences successful businesses like Bytedance would need to address, there is still a possibility to improve on algorithms by including inclusive images in TikTok's dataset. This will then help the beauty algorithm promote diversity throughout the app, and further help destroy negative stigmas and toxicity around racial differences in faces throughout the western and eastern societies.

References

1. Dornaika, F., Wang, K., Arganda-Carreras, I., Elorza, A., & Moujahid, A. (2020). Toward graph-based semi-supervised face beauty prediction. *Expert Syst. Appl.*, 142.
2. Gill, D. (2017). Women and men integrate facial information differently in appraising the beauty of a face. *Evolution and Human Behavior*, 38, 756-760.
3. Peng, A.Y. (2020). Alipay adds "beauty filters" to face-scan payments: a form of patriarchal control over women's bodies. *Feminist Media Studies*, 20, 582 - 585.
4. Yoon, S., & Kim, Y. A. (2020). Cosmetic Surgery and Self-esteem in South Korea: A Systematic Review and Meta-analysis. *Aesthetic plastic surgery*, 44(1), 229–238. <https://doi.org/10.1007/s00266-019-01515-1>