

Schedule

- Intro. and Summary - Prof. Kim (5 min)
- DEI in VFX Pedagogy - Prof. Syed (10 min)
- **STS and Rendering – Prof. Malazita (10 min)**
- Next Steps – Prof. Kim (5 min)
- Open Discussion (60 min)

Thanks Jim, I really like this talk. Once again, a longer version is on Hubb, and I encourage everybody to go watch it.

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Let's talk about next year.

Is SIGGRAPH 2022 going to be remembered as that one time we talked about the technical bias in our algorithms, before returning to business as usual?

Or, will it be a pivot point, where the classes of problems, and the types of questions we asked, fundamentally shifted?

I'm going to propose two goals for next year. One narrow, and one broad.

Goal for SIGGRAPH 2022:

Have a discussion of technical bias
within the technical program.

Here was the goal slide from last year.

Goal for SIGGRAPH 2023:

Have a discussion of technical bias
within the Technical Papers program.

Here's a narrow goal I'm going to propose for next year.

"Have a discussion of bias *within the Technical Papers program* of SIGGRAPH 2023."

This is only a one-word change from the goal from last year, but it's a big one. Last year, we were trying to just get a Talk accepted. Now we're going to try to scale the tallest wall. Get a full technical paper accepted that deals with technical bias.

Countering Racial Bias in Computer Graphics Research

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ABSTRACT

Current computer graphics research practices contain racial biases that have resulted in investigations into “skin” and “hair” that focus on the hegemonic racial features of European and East Asians. To broaden our research horizons to encompass all of humanity, we present technical proposals that aim to stimulate further discussion, and pose novel, open research problems.

ACM Reference Format

Theodore Kim, Derek Raji, Syed Wojciech Jarosz, A.M. Durkin, Holly Rushmeier, and Norouzaezahra MCFE. 2022. Countering Racial Bias in Computer Graphics Research. In *Proceedings of SIGGRAPH 22*, ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3528019.3528020>

1 INTRODUCTION

The model of George Floyd made the worldwide protest that erupted in his wake have foregrounded the pervasive nature of systemic racism. Computer graphics research is no exception, as racial bias, irrespective of the historical composition of our community, have contributed to widely biased research practices. The paper aims and struggle has inspired by our algorithms for virtual humans are a direct reflection of the European and East Asian researchers that designed them [1].

To build a better future, and realize ACM SIGGRAPH’s Vision Statement of *Enabling Everyone to Tell Their Story*, we must expand our practice of research problems to encompass the full spectrum of humanity. In the following, we will detail how racial bias pervades the technical language and researchal practices we use in research.

To begin against this historical inertia, we propose a quarterly guide for racial awareness measures, propose qualitative improvements to current research practices, and pose several historically-neglected research questions. Implementing these practices and investigating these questions are a first step towards a more comprehensive approach to computer graphics research.

1.1 Acts, Not People

For the current discussion, we define acts, not just people, as racist in the absence of constant vigilance, we are all capable of committing racist acts that perpetuate existing systems inequalities [2]. This perspective allows us to recognize how seemingly neutral practices

perpetuate racial bias and lead people to act in racist ways. For the current discussion, we define acts, not just people, as racist in the absence of constant vigilance, we are all capable of committing racist acts that perpetuate existing systems inequalities [2]. This perspective allows us to recognize how seemingly neutral practices

perpetuate racial bias and lead people to act in racist ways. For the current discussion, we define acts, not just people, as racist in the absence of constant vigilance, we are all capable of committing racist acts that perpetuate existing systems inequalities [2]. This perspective allows us to recognize how seemingly neutral practices

in computer graphics research have resulted, independent of any individual intent, in measurably biased outcomes. Our supplement provides further details and a bibliography.

Existence, and the corresponding physical mechanism of subliminal scattering has become synonymous with “human skin” in evidence. However, transience is only the dominant visual factor of wrong, white European and fair-skinned East Asians. We found 19 graphics publications, including foundational works on the topic, that solely present renderings of white humans as evidence that subliminal-scattering algorithms can faithfully depict “skin”, “human skin” and “human faces” at least 4 instances. This bias has been reflected in commercial software. Several other publications that include darker skin present them as deviations from the white baseline, further reinforcing the supremacy of whiteness.

Researchers performing the scientific method act of capturing their own experiences have instead perpetuated existing inequalities. Similarly, “hair” has become synonymous with straight or wavy hair, and cleanliness and washing papers clean around this type. However, even a kaliko human in Africa and its attendant dispersal have “skin-oriented” or “hair” bias. We only found two works in the graphics literature that attempt to explore the racial phenomena associated with these feature people. In contrast, AI graphics publications, upon including foundational works, solely present images of straight or wavy hair or evidence that the algorithms can faithfully depict “human hair”. If we do not actively guard against our own biases, we will reproduce existing inequalities.

1.2 Existing Quantitative Measures

One potential solution is to use medical and cosmetic scales to precisely quantify which human characteristics that specific graphics algorithms are rendered to depict. Multiple dermatological systems measure the features of skin, such as the Fitzpatrick scale [3] which classifies white European skin as Type I and darker skin using progressively higher numbers up to Type VI, or the von Luschan and Taylor Hypopigmentation scales, which assign Type 9 to white skin and respectively Type 16 and 19 to dark skin.

These measurement systems all share a problem: they do not identify the primary racial status of the Fitzpatrick scale (liberty the 4) ranking, or placed at the center or origin [2] in the case of the von Luschan and Taylor scales. This grants white European appearance credits, which darker skin is placed at deviant locations (V, 16, and 19) along an unbalanced number line.

Existing hair typing systems that assign hair numbers, the Webster Hair system widely used by related classifiers taught hair as Type Ia. Progressively darker hair is assigned higher numbers, up to Type 4c. The L’Oréal [4] system assigns Type Ia to straight hair, and

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Type VII to kinky hair. Again, European features are 1) white Black features are inappropriately placed in other, or VII.

This seemingly neutral ranking has visible impacts to the graphics literature on human appearance. Past works have included Fitzpatrick Types III and IV [3] in their measurements, but that ranking left out darker-skinned humans. Other works [10] have measured hair types with different official color sectioning systems. European hair seems closest to a hair for the first render only depict straight or wavy blonde hair. The implicit ranking explicitly reproduces bias.

1.3 Proposed Anti-Racist Practices

Adopting scales from medicine and cosmetics can seem appealingly objective, but medical practices are equally susceptible to systemic bias [12]. Moreover, borrowing an existing scale can backfire if it amalgams with the appearance space of interest. Good faith attempts to explore skin appearance across multiple Fitzpatrick values [14] then become beholden to a scale that was designed to classify skin according to its damage susceptibility under UV light and various treatments. We instead advocate multi-dimensional scales designed to racial appearance, such as the Fitzpatrick-based scale inspired by photographer Agathe Van [13].

One-dimensional scales like Webster are appealing because they are straightforward to explain, but reproducing the range of human appearance will almost certainly require a higher-dimensional space. Rather than using the Fitzpatrick scale as a proxy for melanin concentration, we advocate direct reporting of concentrations, while understanding that other factors like spatial and directional variation will introduce further non-linearities. Similarly, L’Oréal [4] uses PCA to reduce the wavelength, curvature and label of hair into a single scale, but a comprehensive visual approach will need to disentangle these factors. Pathologies are a useful way to understand signals, but can be misleading when used to simplify apps.

Measuring and exploring the applicability of existing methods to higher-dimensional parameter spaces via statistical and necessary processes. In order to make progress, we as researchers must commit to recognizing and leveraging positive work that both evaluates current methodologies, and develops novel techniques for measuring the applicable range of new and existing methods.

Once measurements are in hand, we must take care to avoid just mistakes, and choose a system that does not implicitly create certain populations. For this purpose, we propose a quarter circle algorithm where the real world conditions are placed to zero. This measure has several features:

- The origin is established as our value class “the center”
- The appearance of 1 signals the endpoint of a scale, but neither $(1 + 0)$ nor $(1 + 1)$ can claim the ranking of 1.
- All points on the scale have a measured mean of 1. No value has a greater or lower magnitude than any other.

The circular nomenclature of complex or imaginary reflects the larger social, political and biological dimensions. Some will view this mapping as addressing an imaginary problem. We assert that the problem are both real and complex.

The main purpose of our quarter circle equations is to initiate discussion of a theory problem, not to claim to have formulated an

alternative solution. Alternative proposals are not only possible, but welcome.

1.4 Future Research Directions

The preceding discussion suggests a variety of directions.

- What is a complete evaluation metric for these skin? What do the blue tones color form, and could it benefit from a custom, multi-layer MLP model?
- What is an efficient simulation model for kinky hair? Could such behavior differentiate from the straight case?
- What is an efficient rendering model for kinky hair? Can the anti-fragile strand distribution be leveraged? Do wave-based sub-surface phenomena gain importance?

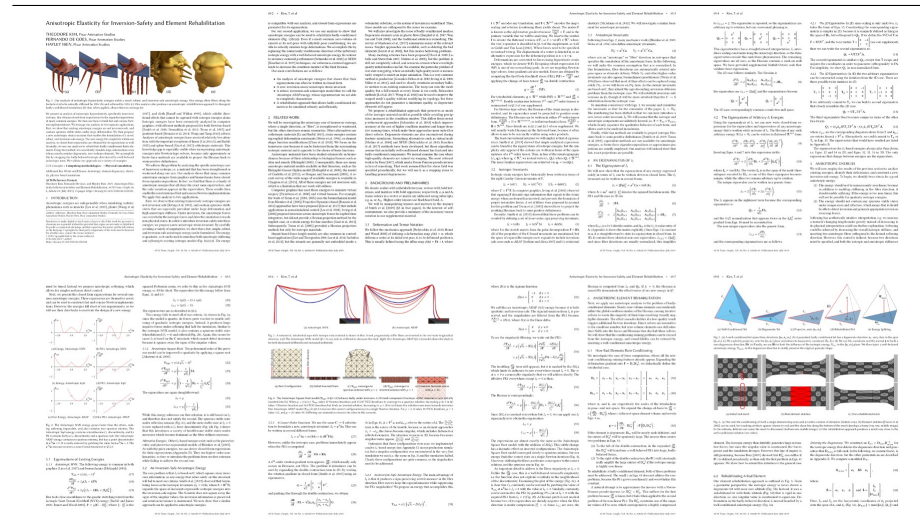
When investigating these questions, it is imperative to actively recruit and engage stakeholders that both inhabit the form of human being modeled, and the intersection of the technology [5]. This is a scientifically neutral practice: nobody is better positioned to formulate algorithms that explore the subtle qualities of black skin and kinky hair than somebody who sees them in the mirror every morning. Such practice would increase the diversity of our community and reduce the risk of publishing well-intentioned but opaque procedures. Blackhair: Skin of Color API and papers.

This work will require grappling with uncomfortable truths, and will be a process of fine-tuning and iteration. However, these are necessary steps towards creating an environment that values human self-reflection and open dialog. Progress is greatly needed, because computer graphics algorithms are increasingly being used to provide training and feedback learning, so the potential to amplify existing inequalities has never been greater [1]. By bearing long past mistakes, we can instead move towards a future where everyone can tell their story. We commit to working out that future.

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Not just one of the small two-pagers



one of the big honking 15-pagers full of equations that actually counts as a scientific journal article.

Using STS to Bridge Long Histories of Blackness, Specularity, and Rendering

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ABSTRACT

Science and Technology Studies (STS) is an academic interdisciplinary that uses sociological and historical methods to study the interrelations of society and technoscience. This paper uses an STS approach to examine the historical feedback loops between "rendering" the shine and specularity of Black skin—across painting, video, and photography—and how computer graphics programmers and artists should question some of the fundamental assumptions of their rendering workflows to both create more equitable representation of human form, and also to understand how computational

trace how the rendering of Black skin—through painting, photography, and videography—presents social realistic elements as mimetic elements, leading to the rendering of Black skin that "looks right" to the white eye, leading to anti-Black biases in visual art. As computer graphics works to more closely replicate the cinematic camera apparatus—particularly through techniques like Physically Based Rendering—digital artists and developers must be cognizant of the biases built into the scientific studies and technological systems new digital rendering systems are based upon in order to foster a more equitably rendered world.

Gender and Sex in the Computer Graphics Research Literature

Ana Dodik
Meta Platforms

Silvia Sellán
University of Toronto

Theodore Kim
Yale University

Amanda Phillips
Georgetown University

ABSTRACT

We survey the treatment of sex and gender in the Computer Graphics research literature from an algorithmic fairness perspective. The established practices on the use of gender and sex in our community are scientifically incorrect and constitute a form of algorithmic bias with potential harmful effects. We propose ways of addressing these trends as technical limitations.

given a precise definition, and are used as an proxies for features such as body proportions, facial expressions, or patterns in speech.

From an algorithmic fairness perspective (§2.1), our analysis reveals a worrying status quo in the use of gender and sex as variables. When we mention specific examples that perpetuate these trends, we stress that we are not associating any malicious intent. Rather, we are showing how seemingly neutral, well-established practices can unwittingly perpetuate forms of algorithmic bias.

The groundwork has been laid. You can cite the Talks from this year as evidence that this bias is real. You'll have built-in backup when Reviewer #2 inevitably complains "What racism? I've never heard of it" or "What anti-trans bias? I've never heard of it" You now have peer-reviewed backup that you can cite.

Space Rangers with Cornrows

Methods for Modeling Braids and Curls in Pixar's Groom Pipeline

Sofya Ogunseitan
Pixar Animation Studios



(a) Izzy Hawthorne

(b) Alisha Hawthorne

Figure 1: Lightyear characters Izzy and Alisha Hawthorne and their respective grooms. ©Pixar.

You can try to go the traditional route, and write a technical paper that deals with historically neglected problems like rendering Black skin or simulating Type 4 hair.

You can now point to Sofya Ogunseitan's awesome Talk on the topic, and say "see, this is a real problem that Pixar cares about."

Postcolonial Computing: A Lens on Design and Development

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ABSTRACT

As our technologies travel to new cultural contexts and our designs and methods engage new constituencies, both our design and analytical practices face significant challenges. We offer postcolonial computing as an analytical orientation to better understand these challenges. This

In this paper, we examine a series of concerns that are latent within much research conducted under the umbrella of HCI4D. We take as our starting point a move from "development" discourse to postcolonial discourse – that is, a discourse centered on the questions of power, authority, legitimacy, participation, and intelligibility in the contexts

Or, you can try to expand the problem space. Jim Malazita pointed me to this paper from CHI 2010. This is a full paper, and a super-popular one too – over 655 citations on Google Scholar.

They expanded the problem space of research questions by applying the STS lens of post-colonialism. What narrow technical assumptions have we been running with in graphics that need re-examination?



Here's one the technology we use to make Marvel movies will have trickle down effect to AAA games, and from there to indie game studios.

So by making new tech for Marvel movies, eventually everybody will benefit.

Is that true? Maybe what's good for making Marvel movies is actually only good for making Marvel movies.



Same problem, different direction: the technology we use to make Hollywood movies applies equally well to Bollywood



And to Nollywood.

The same tech will just trickle down. Is that really true?



One colleague who shall remain anonymous mentioned that some of the saris that you see in Bollywood movies can get really intricate. Would you really just throw this at Maya nCloth and hope for the best?

Code Replicability in Computer Graphics

NICOLAS BONNEEL, Univ Lyon, CNRS, France
DAVID COEURJOLLY, Univ Lyon, CNRS, France
JULIE DIGNE, Univ Lyon, CNRS, France
NICOLAS MELLADO, Univ Toulouse, CNRS, France



Fig. 1. We ran 151 codes provided by papers published at SIGGRAPH 2014, 2016 and 2018. We analyzed whether these codes could still be run as of 2020 to provide a replicability score, and performed statistical analysis on code sharing. Image credits: Umberto Salvagnin, Blueose Girl, Dmitry B., motiqua, Ernest McGray Jr., Yagiz Aksoy, Hillebrand Steve. 3D models by Martin Lubich and Wig42.

This sort of problem space expansion actually happens all the time in graphics.

We've got this paper from 2020 that surveyed how feasible it is to replicate code in graphics.

“algorithm reproduction – it’s a new problem!”

This kind of problem space expansion can be done, and has been done before, just not on the problem of technical bias.

Goal for SIGGRAPH 2023:

Have a discussion of technical bias
*within the **Technical Papers** program.*

Now I said this is the narrow goal. I realize only professors or a high-powered industry researchers are in a position to spearhead a technical paper. What about everybody else?

Goal for SIGGRAPH 2022:

Have a discussion of technical bias
within the technical program.

A second goal. Again let's start from that slide from last year, and apply a minor transformation.

Goal for SIGGRAPH 2023:

*Expand the problem space of
the technical program.*

Okay, minor wording change from the goal from last year, but on the front part, not the back part.

I said that somebody should write the problem-space expanding technical paper for SIGGRAPH next year. Well, that moment already arrived for the Talks program this year!

We opened the thinnest crack on racial bias and gender bias at SIGGRAPH. Can we actually pry this crack into something bigger?

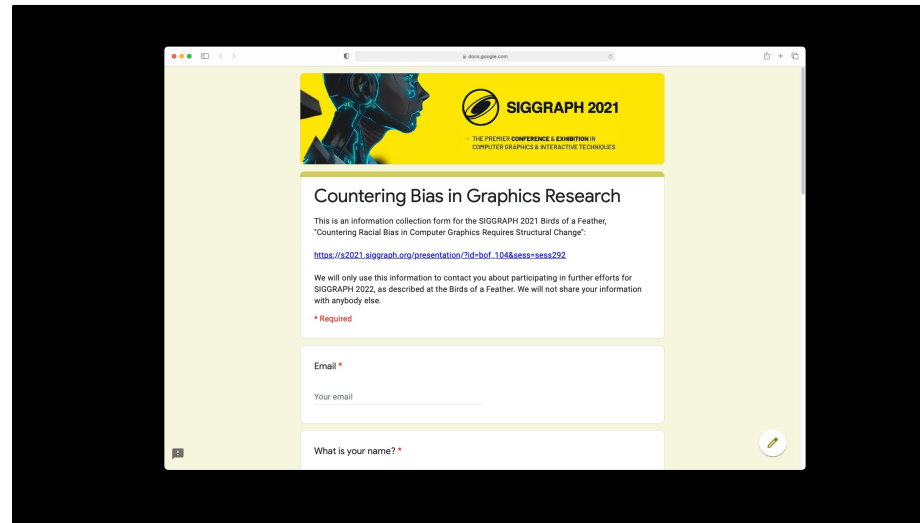
Industry folks:

Datasets on human appearance?

Skin and Hair shader best practices?

Skin and Hair shader challenges?

“This Weird Trick Seems to Work”



Last year, I sent out a sign-up form, and organized everybody who signed up. This is a community effort though, it's not about me.

<https://discord.gg/RCsX3xJx>

This year, we set up a Discord server for people who are interested in discussing these issues, and interested in organizing for submissions next year.

If you're interested in this, here is the Discord invite. I know that SIGGRAPH already has their own Discord server, but I think it goes away after SIGGRAPH ends. Also, we want you to be able to invite *all* your colleagues who are interested, not just the ones who paid the SIGGRAPH registration.

Please feel free to send to whoever might be interested.

Goals for SIGGRAPH 2023:

Have a discussion of technical bias
within the Technical Papers program.

Expand the problem space of
the technical program.

So, I am proposing two goals for next year:

"Goal: Have a discussion of bias *within the Technical Papers program* of SIGGRAPH 2023."

"Goal: *Expand the problem space of* the technical program of SIGGRAPH 2023."

These are 100% up for debate.

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- Next Steps – Prof. Kim (5 min)
- Open Discussion (60 min)

Which leads directly into Open Discussion.

Like last year, I'd like to structure this is using the Raise Hand function. If you raise your hand, it will show up on my side in the order they were raised, and then I can call on people.

“Raise Hand” to raise new topic

The way I'd like to structure this is using the Raise Hand function.

The way Zoom works is that it will order the hands on my side according to who raised first. I'll call on people in order.

“Raise Hand” to raise new topic

Write “Comment” in chat to comment on
current topic

If you want to comment or respond to the topic under discussion, please write “comment” in the chat window. I can then call on you from there.

Then you’ll jump the line, and you can respond to the current topic.

Once a topic wraps up, I’ll go back to the raised hand queue.

“Raise Hand” to raise new topic

Write “Comment” in chat to comment on
current topic

We're not recording

We are not recording, so feel free to speak openly.

The one caveat here is that Raqi will be writing your questions, WITH YOUR IDENTITY STRIPPED, to the main chat on the Discord server.

This is here so we can track the questions and issues people are interested in, and so that people who came late can quickly catch up.

*Countering Bias in Computer Graphics
Research (The BOF!): One Year Later*

Theodore Kim and Holly Rushmeier, Yale University

Raqi Syed, Victoria University of Wellington

Wojciech Jarosz, Dartmouth College

Derek Nowrouzezahrai, McGill University

James Malazita, Rensselaer Polytechnic Institute

SIGGRAPH Birds of a Feather, August 8, 2022

All right everyone, that's it for the scripted portion for tonight.

What's on your mind?