

# Automated Detection of Skin Tone Diversity in Visual Marketing Communication

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## Abstract

*Companies invest heavily in diversity, equity, and inclusion efforts. Specifically, the representation of people in visual marketing communication is often considered a manifestation of diversity policies. We propose a standard framework built on machine learning to create novel measures quantifying skin tone dynamics. We first use the Swin Transformer to extract skin pixels from images. Next, the K-means algorithm is deployed to classify skin tone components from the extracted skin pixels, accounting for multiple people with distinct skin colors in an image. Using images posted by 34 fashion brands on Instagram and Twitter, we demonstrate a useful application of the tool. The results highlight that, in the past two years, the fashion industry has slightly increased its diversity, represented by the increased variety of skin tones of people included in social media posts. Our method allows for automated detection of objective measures of skin-tone diversity in visual marketing communications.*

**Keywords:** diversity, skin tone, machine learning, image mining, social media

## 1. Introduction

Companies are under tremendous pressure to manage their diversity, equity, and inclusion (DEI) efforts. Internally, the policies are proven to be vital in creating and maintaining a successful workplace. Externally, consumers are more likely to engage with a brand that looks diverse (GYNN, 2020). A research report conducted by Adobe in 2019 revealed that for 61% of Americans, diversity in marketing is crucial to their purchase decisions (Adobe, 2019). Consequently, studies from McKinsey & Company and The Wall Street Journal show that companies with different

levels of diversity perform heterogeneously in terms of operating results, innovation, and profits (Watkins, 2021). However, most marketers agreed that more can still be done, especially regarding how diversity is portrayed in marketing contents (Molenaar, 2021).

One particular area of marketing for DEI is representation. While companies actively demonstrate their DEI commitment through marketing communications, the communication content can also be regarded as informational cues representing their DEI standpoint. For example, brands post curated visual content to promote their products, shape consumer perceptions, and increase awareness on social media. The choices of people, their sizes and skin tones, and the diversity of such can strategically signal the brands' inclusivity and legitimacy to consumers. Equally, consumers can interpret the diversity signals represented in the content. While genuinely diverse and inclusive content that resonates consciously and subconsciously with audiences and stakeholders requires far more than an image (GYNN, 2020), our study responds to the call that there is a pressing need to study media representations of diversity (Arsel et al., 2022).

Variety in skin tones in the visual presentations has been considered a reflection of diversity (Sweeney & Whaley, 2019). Some brands could argue this is to strategically deploy people with desired skin tones to advertise their products for targeting specific marketing segments. The representation of skin tones in brands' visual communications could vary across industries and sectors, and even over time. Prior studies have researched color representation in the beauty (Frisby et al., 2019) and fashion industry (Butkowski et al., 2022), and confirmed an overall tendency toward lighter-skinned people. Therefore, it is crucial to be