

Tyla Stevenson

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Tyla Stevenson

The Materiality of Virtual Fashion

Abstract

Digital fashion, a burgeoning intersection of digital media and the fashion industry, consists of 3D-modeled garments and accessories that are represented through digital environments such as metaverses, augmented reality (AR), virtual reality (VR), and sold or authenticated using non-fungible tokens (NFTs). Unlike physical fashion, these digital items do not exist in conventional material form and are not designed for physical wear, shifting the pictorial representation of fashion from digital photography to computer-generated imagery (CGI). This paper critically examines discourses surrounding digital fashion and the perceptions of immateriality as well as common associations between technological advancement and political and social progress. These discourses are often framed by technological determinism, which positions the rise of digital worlds as inevitable, and presents innovation as a natural response to historical developments.

The aim of this paper is to highlight the materiality of digital fashion which arises from the engagement between physical bodies and digital spaces. Furthermore, this process relies on physical infrastructures, from technological hardware and servers to the environmental impacts tied to its circulation and storage, and is further shaped by the software and platforms that enable its production and use. This study provides a framework to engage critically with digital fashion's conceptual and material dimensions, offering insight into its evolving role in the larger discourse on technology and culture as virtual spaces continue to expand.

Digitale Mode, eine aufstrebende Schnittstelle zwischen digitalen Medien und der Modebranche, besteht aus 3D-modellierten Kleidungsstücken und Accessoires, die in digitalen Umgebungen wie Metaversen, Augmentierter (AR) und Virtueller Realität (VR) und Nicht-Fungible Tokens (NFTs) dargestellt werden. Im Gegensatz zu physischer Mode existieren diese digitalen Artikel nicht in herkömmlicher materieller Form. Da sie auch nicht für das

physische Tragen konzipiert sind, verlagern sie die bildliche Darstellung von Mode von der digitalen Fotografie hin zu computergenerierten Bildern (CGI). Bestehende Diskurse rund um digitale Mode und die Wahrnehmungen von Immaterialität, sowie gängige Assoziationen zwischen technologischer Entwicklung und politischem und sozialem Fortschritt, analysiert dieser Beitrag kritisch. Solche Diskurse sind oft von einem technologischen Determinismus geprägt, der den Aufstieg digitaler Welten als unvermeidlich darstellt und Innovation als natürliche Antwort auf historische Entwicklungen präsentiert.

Das Ziel dieses Papers ist es, die Materialität digitaler Mode hervorzuheben, denn Online-Identitäten werden durch die fortwährende Wechselwirkung zwischen physischen Körpern und digitalen Räumen gestaltet. Darüber hinaus stützt sich dieser Prozess auf physische Infrastrukturen, von den Technologien, die digitale Mode produzieren, bis hin zu den Umweltauswirkungen, die mit ihrer Verbreitung verbunden sind. Zusätzlich wird dieser Prozess durch die Technologien eingeschränkt, die die Entstehung digitaler Mode ermöglichen. Dieser Beitrag bietet einen Rahmen zur kritischen Auseinandersetzung mit den konzeptionellen und materiellen Dimensionen von digitaler Mode und gibt Einblicke in ihre sich wandelnde Rolle im größeren Diskurs von Technologie und Kultur, während virtuelle Räume weiter expandieren.

Introduction

Virtual fashion is a commodity, typically a garment or an accessory that is three-dimensionally modelled and disseminated through visual communication technologies and online platforms. This includes the clothing of avatars in metaverse environments, the exchange of non-fungible tokens (NFTs), which in this context refers to digital artworks recorded on the blockchain to verify ownership, and the design and acquisition of in-game skins within video game settings. Virtual fashion also encompasses augmented reality (AR) and virtual reality (VR) overlays—images intended to superimpose digital photographs, enhancing or transforming the wearer's representation. What fundamentally distinguishes virtual fashion from digital representations of physical garments (such as photographs of real-life clothing shared on social media) is its lack of conventional materiality. This refers to the tangible and physically embodied qualities traditionally associated with dress. These items do not exist as physical garments designed for bodily adornment but rather as intangible visual artifacts. This shift signals a broader transformation in the pictorial representation of dress from

digital photography toward computer-generated imagery (CGI), reshaping how garments and the bodies that ‘wear’ them are conceived and visualized.

This paper critiques the narratives promoted by virtual fashion branding, which often present technological progress as both inevitable and tied to social advancement. These narratives portray virtual fashion as immaterial and frame virtual worlds as an unavoidable result of historical change. In doing so, they obscure the material realities of virtual fashion production and its wider implications.

Furthermore, I demonstrate the materiality of virtual fashion by examining both the embodied experiences of digital garments and the infrastructural realities that underpin them. Drawing on Walter Benjamin’s materialist philosophy, I argue that virtual fashion, often promoted as immaterial, is deeply enmeshed in material systems. These systems shape not only the aesthetic and embodied experiences of digital fashion but also its broader implications for sustainability. This paper explores the materiality of digital fashion by examining both the embodied experiences of digital garments and their environmental and infrastructural implications. Through this lens, the aesthetic, embodied, and infrastructural aspects of digital fashion are shown to be interconnected, offering a more comprehensive view of its material reality.

1. Defining Terms

Before delving into these discourses, a clarification of the terminology at hand is needed. While both ‘virtual’ and ‘digital’ fashion refer to fashion mediated through technology, it is important to clarify why ‘virtual’ is used in this context, as some authors, including Spicher et al., use the terms interchangeably when discussing the metaphysical properties of digital fashion (2024: 43). The term ‘virtual fashion’, as used in this paper, specifically denotes garments rendered through 3D technologies and experienced within immersive environments such as VR platforms, metaverses, and AR applications. In contrast, ‘digital fashion’ can encompass the online circulation of photographs of physical garments, such as images shared on social media.

The distinction matters because the virtual, as a concept, is frequently associated with intangibility, an association that shapes how virtual fashion is marketed. ‘Digital fashion’ functions as a broader category that includes not only virtual clothing but also representations of physical garments in digital spaces. While digital fashion is the term that is more popular to describe virtual commodities; I argue that both terms share intersections in the contemporary discourse surrounding fashion mediated by technological innovation and understandings of virtuality.

Rob Shields in *The Virtual* highlights how discourses surrounding virtuality tend to trivialize the material underpinnings of virtual or digital phenomena (2002: 79). By emphasizing the ephemeral or intangible aspects of the virtual, these narratives obscure the substantial physical infrastructure that supports digital technologies. Sy Taffel elaborates further on this point:

“The term ‘virtual’ gestures towards the somehow not quite there, an ethereal spectre which grasps at but never quite reaches reality. While there is a more concrete definition of the term ‘virtualization,’ which specifically refers to the software-generated simulation of one computational platform by another, the commonplace notion of digital technology as relating to virtual spaces, virtual communities, and virtual reality is a discursive practice that obfuscates the complex and often poorly understood materiality of microelectronics.” (TAFFEL 2019: 160)

Both the virtual and digital are frequently portrayed as weightless, existing apart from the physical world (ibid. 2016: 121). However, digital environments depend on extensive technological infrastructures including servers, data centers, rare earth minerals, and labor, underscoring that virtuality is not immaterial but deeply entangled with material processes. This research seeks to expose these connections, challenging the discursive tendency to separate the virtual from its material conditions.

2. Theoretical Framework and Methodology

This paper approaches virtual fashion through Walter Benjamin’s materialist philosophy, which offers a distinct approach to understanding commodities and their representational forms. Although influenced by Marxist dialectical and historical materialism, Benjamin’s works, including *The Arcades Project* as well as *Theses on the Philosophy of History*, present a rethinking of historical processes, one that resists linear conceptions of progress and history. Löwy claims that Benjamin’s skepticism toward the ideology of progress emerges from his critique of a vulgar historical materialism, which, in his view, often reduces complex socio-historical developments to simplistic, deterministic narratives (LÖWY 2014: 25). Rather than accepting progress as an automatic and inevitable force, Benjamin emphasizes the ruptures and discontinuities that shape history as the potential for revolutionary intervention (BENJAMIN 1996: 396).

Benjamin suggests that material objects, like fashion, carry deeper historical and cultural meanings beyond their commodified forms, reflecting the dialectical relationship between past and present (BENJAMIN 1996: 395). New materialist researchers describe this as Benjamin identifying a lifespark within material objects (BOSCAGLI 2014: 40). New materialist frameworks, such as those discussed by Smelik (2018) and Martach (2020), have been recognized for their relevance to

fashion. However, this paper refrains from adopting new materialist perspectives. While valuable, instead, I prioritize Benjamin's materialist philosophy, still grounded in a Marxist approach which offers a lens to critically examining how virtual fashion remains grounded in material conditions, such as technological production, environmental impacts, and embodied interactions.

This research employs a combination of methodologies, including applied theory (following GRANATA 2016) and the walkthrough method (following LIGHT et al.). Granata's approach to the methodology, called applied theory, is a multi-disciplinary approach, which requires analysing fashion artefacts such as promotional writing and images in context of theoretical frameworks (GRANATA 2016). On the other hand, the walkthrough method, which involves navigating a website interface and observing key elements for later analysis, grounded in science, technology studies, and cultural studies, serves as a structured approach for collecting data and critically assessing software applications (LIGHT et al. 2016: 881). Although traditionally applied to smartphone apps, the present paper adapts this methodology in order to explore website-based experiences, which similarly provide interactive elements and facilitate active consumer engagement online.

Recognizing computational technologies as socio-cultural artefacts, the walkthrough method challenges the notion that technology alone can sufficiently answer social science inquiries (ibid. 2016: 885). Through direct interaction with digital interfaces, the method enables an analysis of technological tools, outputs, and their subtle semiotic cues, revealing how cultural meanings shape user experiences. The walkthrough focuses not only on surface-level design, but also on the embodied interactions users have with the technology, emphasizing the material dimensions of digital and virtual experiences that are often perceived as immaterial. By incorporating this method, this paper critically engages with how virtual fashion platforms structure user interactions and promote particular technological deterministic discourses. The technical walkthrough further highlights how the physicality of devices through touchscreens, hardware, and interface navigation, mediates the virtual experience, reinforcing the material underpinnings of seemingly immaterial virtual fashion practices.

The following analysis is the result of three virtual fashion case studies, of the website *DRESSX*, of digital fashion brand *Auroboros*, and of the two digital-only Helsinki Fashion Weeks in 2020 and 2024. Although their outcomes and purposes differ, they exemplify a mixed reality where bodies, virtual environments, identities, and material forces are deeply interrelated. These interconnections shape users' experiences and challenge the dichotomy between physical and digital realms.

3. The Continuous Link to the Fleshy Body

DRESSX is a digital fashion boutique that hosts a range of virtual fashion brands. The platform allows individuals to purchase virtual fashion items. Upon purchase, *DRESSX* superimposes the chosen virtual garment onto a photo provided by the customer, returning an edited image for the customer to share on social media platforms. *DRESSX*'s primary objective is for consumers to share images of themselves wearing virtual garments on social media platforms, effectively instrumentalizing users as promotional tools for the platform/boutique itself. Social media platforms, while virtual, are extensions of users' lived realities as they curate and represent real-life experiences for digital consumption. Furthermore, *DRESSX*'s service relies fundamentally on the image of a material body that is superimposed with virtual clothing. Without the user's material body, virtual fashion has no foundation. Once shared online, these images re-enter the material world through reactions, comments, and discussions—both virtual and face-to-face—demonstrating the seamless interplay between physical and digital experiences. As Brians articulated, “though the identities produced online are not reducible to biological bodies, they are formed in relation to them” (BRIANS 2011: 138). Online identities emerge from a continuous negotiation between physical embodiment and virtual spaces, shaped and constrained by the technological frameworks enabling these interactions.

Even in digital spaces that offer theoretically limitless possibilities for representing bodies, what is presented often mirrors the physical fashion industry. For instance, the digital-only Helsinki Fashion Week (HFW), as it took place in 2020 and 2024, emerged in response to the evolving fashion industry demands and global events like the COVID-19 pandemic. As one of the first to fully embrace digital platforms, HFW reimagined traditional runway shows with virtual environments, 3D garments, and immersive experiences. The goal was to promote sustainability by reducing the environmental impact of physical shows, while also pushing the boundaries of how fashion is visualized and consumed. However, despite the innovation of digital spaces, the technology used for virtual presentations exposes certain limitations: The digital avatars and 3D renderings often reflect normative body standards, adhering to ideals of thinness, symmetry, and smooth textures (Fig. 1). This technological constraint not only limits the diversity of body types represented, but also reinforces narrow beauty standards long criticized in the fashion industry. While virtual platforms like HFW have strong potentials to foster inclusivity; current technology struggles to accurately represent a wide range of body shapes, sizes, and abilities.



Fig. 1: N&S Gaia. Screenshot taken by author. Helsinki Fashion Week.

4. The Materiality of the Virtual

Shields highlights the dichotomy of the real and the virtual, noting how virtual implies a lack of tangible presence despite its reliance on physical technologies (SHIELDS 2002: 2). Virtual reality, for instance, simulates experiences through hardware interfaces, but the objects experienced remain immaterial projections.

DRESSX's mission statement encapsulates this tension: "We share the beauty and excitement that physical fashion creates, but we believe that there are ways to produce less, to produce more sustainably, and not to produce at all" ("DRESSX VISION"). This statement implies that virtual garments can transcend materiality. Yet, virtual fashion production is inseparable from material infrastructures. Designing virtual garments requires hardware, data servers, and user devices. Customers must possess smartphones, computers, and stable internet connections to engage with these services. Similarly, Auroboros's designs, which are no longer available on the DRESSX website, although intended to be quite alien, are still tailored to the contours of physical bodies, underscoring the enduring link between virtual fashion and material embodiment.

Auroboros is a physical haute couture *plus* virtual ready-to-wear fashion house founded by Paula Sello and Alissa Aulbekova. Their "Nature-Tech" collection embodies an otherworldly and alien aesthetic that purposefully defies physical laws. Rooted in biomimicry, a design approach that draws inspiration from natural forms and processes, Auroboros's virtual garments replicate elements of botany, featuring ornamental details reminiscent of flowers, vines, stems, roots, and pollen. Rendered in a metallic palette of blues, pinks, greens, and silvers,

these designs blur the boundaries between organic and synthetic. The Biomimicry Bodysuit (Fig. 2), envelops the wearer in vine-like structures and floating petal-like particles, described with language associating opal crystals and moonlit foliage. Marketed as clothing that can grow or rather digitally morph on the wearer in real time, the garment creates an immersive digital experience that emphasizes transformation and fluidity. Through such designs, Auroboros explores speculative possibilities for fashion beyond material limitations.



Fig. 2: Auroboros ‘Biomimicry’ RTW Digital-Only Collection, styled by Sita Abellán. June 14, 2021.

By prioritizing futuristic and alien aesthetics, Auroboros further distances their designs from historical fashion references, contributing to the illusion that virtual fashion exists in an eternal present, disconnected from fashion’s cyclical temporality and cultural lineages. This aesthetic strategy supports the broader techno-fantasy of a virtual future unbound by material realities or historical continuity, while in practice, it remains deeply entwined with them.

5. Auroboros and the Ideology of Progress

Auroboros’s branding and promotional materials hinge on two central ideological elements: the ideology of progress and the allure of cyber fantasies that promise transcendence through virtual embodiment. Benjamin’s skepticism toward the concept of progress is pivotal here. He critiques the assumption that technological advancements automatically correlate with social and political liberation, a narrative Auroboros embraces (BENJAMIN 1996: 393). On their website they promote their brand as “... not just creating products; it is cultivating a lifestyle that embraces technology to enhance personal and planetary wellbeing” (About us). This ideological framing positions virtual fashion as not only transformative but

a moral and ecological good that conflates technological engagement with ethical action. The promise of a frictionless, progressive future risks overshadowing the lived material realities of marginalized populations during these technological shifts. Under the guise of innovation, Auroboros frames technological development as both natural and inevitable, reinforcing a linear, teleological view of progress. As Buck-Morss explains writing on Benjamin, this framing risks perpetuating historical myths constructed to serve ruling-class interests while obscuring structural inequalities (BUCK-MORSS 1989: 71).

Benjamin's metaphor of revolution as an emergency brake counters the blind acceleration of technological advancement (BENJAMIN 1996: 402). Whereas a traditional Marxist maintains the fall of capitalism and rise of a socialist and eventually a communist society as an automatic or unavoidable process; Benjamin claims that it is not through technological progress that revolution is inspired, but in the interruption, or halting of progress. One of Benjamin's most memorable comments on this idea is: "Marx says that revolutions are the locomotive of world history. But perhaps it is quite otherwise. Perhaps revolutions are an attempt by the passengers of the train—namely, the human race—to activate the emergency brake" (ibid.). Rather than seeing innovation as an automatic catalyst for liberation, Benjamin advocates for disrupting the sleeping collective induced by capitalist modernity's promises of constant progress. Auroboros's narrative of infinite technological expansion and emancipation through virtual fashion thus warrants scrutiny. Beneath Auroboros's sleek digital aesthetics and emancipatory marketing lies an extractive infrastructure, one sustained by energy-intensive computation, exploitative labor practices, and global inequalities in access and visibility. Far from inhabiting a utopian elsewhere, these systems are embedded in, and shaped by, contested material conditions.

6. Bits and Bobs

Sustainability has been a selling point for the integration of digital fashion technologies. *DRESSX*, for example, positions digital garments as a solution to the environmental harms of fast fashion: "Production of a digital garment emits 97% less CO₂ than production of a physical garment and, on average, saves 3300 liters of water per item" (*DRESSX* "Sustainability"). Such claims are compelling, particularly in a fashion industry that is grappling with overproduction and resource depletion. Yet, they overlook the energy demands of digital infrastructure, particularly data storage and transmission. Despite *DRESSX*'s acknowledgment of their carbon footprint, their measurements in their 2020 reporting exclude the energy used to maintain cloud-based archives, an oversight that masks the full environmental cost of digital fashion (ibid.).

Comparative studies, such as the carbon footprint analysis undertaken by company Normitive of Helsinki Fashion Week's digital event in 2020, illustrate the complexities of sustainability claims. While per-attendee emissions dropped, overall emissions increased due to higher virtual attendance (CHAN 2020). This example highlights a key trade-off: Digital platforms can democratize access but may inadvertently increase aggregate environmental impacts.

While virtual fashion may reduce certain supply chain emissions, it is unlikely to replace physical fashion entirely (BERNAT 2024: 275). Consumers continue to purchase physical garments, and virtual fashion primarily supplements rather than supplants existing consumption habits. Thus, equating virtuality with inherent sustainability is misleading and risks perpetuating techno-optimist ideologies without addressing underlying patterns of overconsumption, as expressed by the DRESSX tagline "Don't shop less, shop digital fashion" ("DRESSX.com – The World's Leader in AI, AR, and Avatar Fashion Technologies").

For a deeper understanding of digital fashion's implications, it is essential to examine the materialities of the software and infrastructure it depends on. The perceived dematerialization of digital fashion contrasts sharply with the substantial ecological costs and social inequalities embedded in the production, use, and disposal of the digital technologies it relies on. These technologies, such as the software and hardware that power virtual environments, can act both as tools for social and ecological liberation, or contribute to the continuation of existing global inequalities.

Taffel's examination of digital culture's environmental and social implications provides an insightful critique of the infrastructure that supports digital fashion. He highlights the increasing energy demands of global information and communications technology (ICT) systems, which are projected to account for a growing share of global energy consumption (TAFFEL 2019: 169). This is particularly relevant when considering digital fashion, as the virtual spaces in which it resides such as metaverses, NFTs, or AR/VR environments, are built upon vast networks of data centers, servers, and computational hardware. Recent research supports this concern; a report from the Lawrence Berkeley National Laboratory (LBNL) shows that U.S. data centers consumed approximately 4.4% of the nation's electricity in 2023, with projections estimating a rise to between 6.7% and 12% by 2028 (SHEHABIN et al. 2024: 52)

Moreover, Taffel critiques the planned obsolescence of digital devices, noting that their short lifespan exacerbates environmental degradation (TAFFEL 2019: 173–174). This mirrors the logic of fast fashion, where rapid trend cycles and seasonal collections foster a culture of constant renewal and disposability. In virtual fashion, obsolescence manifests through frequent updates to virtual garments, avatar accessories, and platform aesthetics that push users toward perpetual

consumption. Like fast fashion, the value of these digital commodities is tied to their newness rather than durability or longevity. The accelerated turnover of styles and features within virtual environments thus replicates the consumption-driven model of traditional fashion, raising critical questions about the sustainability claims of digital alternatives.

The similarities between digital and traditional fashion extend beyond consumption cycles to the systems of exploitation underpinning both industries. Taffel's analysis of digital technology's reliance on exploitative labor and resource extraction (*ibid.*: 169) resonates with longstanding critiques of the fashion industry. For example, the mining of coltan is a key component in microelectronics that has been linked to severe human rights violations, including child labor and environmental destruction in the Democratic Republic of Congo (*ibid.*: 164). Devices essential for virtual fashion, from smartphones to VR headsets, are embedded within these global supply chains, highlighting the direct connection between digital infrastructure and exploitative practices.

While virtual fashion is often marketed as an environmentally friendly alternative to physical garment production, it is not immune to similar systemic issues. The materials underpinning digital infrastructure, including rare earth metals, the energy demands of data centers, and the environmental burden of electronic waste, contribute to a broader ecological crisis. Additionally, virtual fashion's reliance on unpaid labor, through user-generated content and open-source contributions, as seen on platforms like Second Life and Fortnite, further underscores its entanglement with capitalist systems that prioritize profit over equitable labor practices (*ibid.*: 173).

This discussion serves as a reminder that the image seen on a screen, or mediated through digital communication technologies, is not merely a flat, immaterial representation. Rather, it is produced through a series of interrelated material ecologies. Behind the visual surface lies an extensive network of data centers, software infrastructures, hardware components, and human labor. Where traditional images were once crafted through chemical processes on paper, contemporary digital images are constructed from code, data, and energy-intensive hardware. The shift from photographic prints to computer-generated imagery (CGI) and digital displays highlights how images today are embedded within global material flows and technological systems, emphasizing that what appears ephemeral on screen is rooted in substantial material and environmental realities.

Conclusion

This chapter critically examines the discourses surrounding virtual fashion, focusing on the material realities that are often overlooked in its production,

consumption, and broader cultural implications. By utilizing Walter Benjamin's materialist framework, the chapter interrogates the ideological narratives of immateriality and technological progress that are central to virtual fashion branding. While virtual fashion presents innovative ways to engage with identity and style, it is inextricably linked to the same material processes and social dynamics that shape traditional fashion industries.

The materiality of virtual fashion is not limited to its digital representation but extends into the physical world through the infrastructure required to produce, transmit, and consume digital garments. *DRESSX*'s reliance on users' material bodies and social media platforms highlights the continuous link between virtual and physical spaces, showing how digital fashion's impact is mediated by the lived realities of consumers. Even in digital-only fashion events like Helsinki Fashion Week, technological limitations constrain the representation of diverse body types, reinforcing the narrow beauty standards that continue to dominate the fashion industry.

Furthermore, the environmental benefits of digital and virtual fashion are limited by the material and ecological costs of the technologies that support it, and the consumption-driven models that shape both virtual and physical fashion continue to perpetuate systems of overconsumption and exploitation. A more nuanced understanding of virtual fashion's environmental and social implications is essential, one that moves beyond techno-optimism and critically examines the material infrastructures that make virtual fashion possible.

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Figure List

AUROBOROS. ‘Biomimicry’ RTW Digital-Only Collection, styled by Sita Abellán. June 14, 2021. *A Shaded View on Fashion*. <https://ashadedviewonfashion.com/2021/06/14/auroboros-presents-the-inaugural-biomimicry-rtw-digital-only-collection-styled-by-sita-abellan/>

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Biography

Tyla Stevenson is a PhD candidate pursuing Fashion Studies at Toi Rauwhāangi, The College of Creative Art, Massey University. Her background is in Fashion Design (BDes[Hons]) and Media Studies (MA). Her research interests are in the intersections of fashion studies, new media and critical theory focusing on the developments of virtual and digital fashion in online environments.