The Digital Fashion: Concept of realness, Design process and Consumer experience with clothing tailored by AI

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Abstract

Digital fashion has emerged as a transformative force within the fashion industry, revolutionizing traditional design processes and consumer experiences. This article explores the integration of artificial intelligence (AI) and 3D prototyping technologies in the realm of digital fashion in today's digital culture, examining their impact on representation, simulation, and the concept of realness within the way we perceive, consume, and interact with clothing. Sparked a critical examination of the role of traditional fashion designers, as well as consumers within their shopping experience in today's digital landscape. The methodologies conducted in this research combine an explanation of applicative examples and theories of signs related to postmodernism and hyperreality through analytical thinking of signs, whereas fashion design practice and its consumption that leveraging AI become the object of study. It redefines the design process, enhances consumer experiences, and opens up new possibilities for representation and realness. As this digital revolution continues to evolve, it will undoubtedly shape the future of fashion, paving the way for more innovative and inclusive approaches to design and consumption.

Keywords: AI, digital fashion, concept of realness, design process, consumer experience.

Introduction

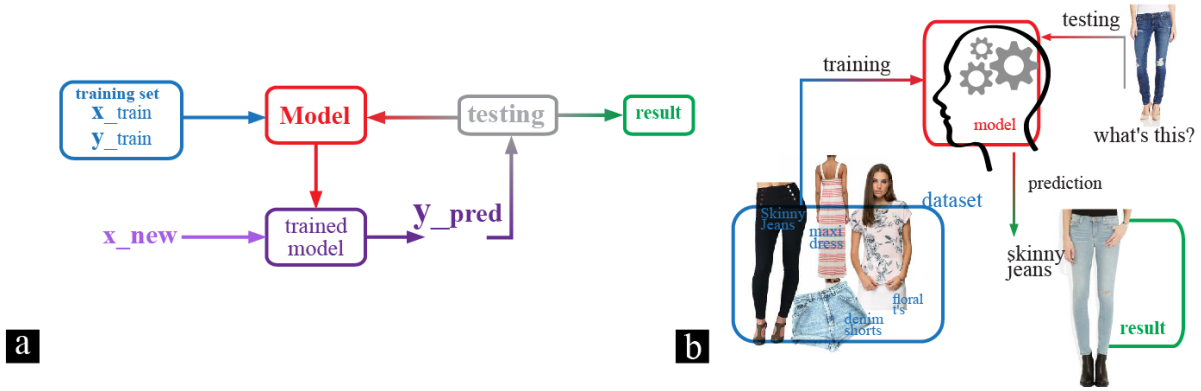
Being mute temporarily upon the hit of the pandemic in 2020, the fashion industry has gained back its power like it has never before thanks to the physical going digital shifted culture that leverages technology. Since everything now going digital, this revolution has transformed the industry of fashion from the design processes to the consumer experiences, becoming immersive, not only digital and physical as a dichotomy but being both called *phygital* for instance by utilizing 3D software, designers are enabled to create their clothing design and see the 3D projection of how it is going to look like without any physical production, this is mean that they can produce more design in a short period. Furthermore, these creative heads can go back and forth between two different reality worlds seamlessly. On top of that AI helps enhance the process and bring the polygon image to life worn by a photorealistically model the consumers who buy would never expect. The consumers want to wear the 3D garment and enjoy the instantaneous virtual try-on or VTO through the magic mirror or their handheld screen. At the same time, AI tracks their joint movement to enrobe the 3D clothing onto their body realistically. Imploded by digital data, AI calculates, analyzes, and predicts trends more accurately and faster than humans do, bringing the future-today reality to the fashion industry. Another phenomenon when the appellation of Metaverse surfaced, 3D designers broke through the conventional chain of hands-on fashion fabrication along the emerging virtual stores, and even the popular and luxurious brands joined the game.

The whole mixed reality experience from the design process to purchasing through which designers and consumers interpret the concept of realness is interrogated and explained in this article by engaging an explanatory of applicative examples and theories of representation and simulation based on postmodernism and hyperreality.

Literature Review

Adapted from Luce in her book titled Artificial Intelligence for Fashion in 2019, fashion challenges human creativity and emotions, making it an ever-changing, adaptive subject. As it is too, AI mimics the human way of thinking to respond to its surroundings. This literature review also refers to a previous journal article by the author titled 'Implementing The Use of AI for Analysis and Prediction in the Fashion Industry.' Since this field is close to the scientific notion, most research discussing AI and ML is explained from a technical informatics perspective, yet the author explains the workings of AI and ML for the more democratic audience with chronological outlining, starting from data sets, machine learning, deep learning, and deep fashion for easy comprehension. (Renaningtyas et al., 2023, 1-9)

Figure 1. Machine learning workflow



ML Training Process (a). Application of ML Model to Deep Fashion with Research-generated Dataset by Zi Wei Liu (b). Source: Luri Renaningtyas in the article "Implementing The Use of AI for Analysis and Prediction in the Fashion Industry."

Data set, ML and Deepfashion

A dataset serves as the training material for creating a machine learning (ML) model. A dataset comprises various types of data excavated from the internet, including data of point-of-sales (POS), geographic information systems (GIS), social media, virtual 3D, sensory data, and textile physical data as introduced in the book titled “Artificial Intelligence for Fashion Industry in the Big Data Era” by Sébastien Thomassey and Xianyi Zeng. In 2016, Zi Wei Liu in his Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), created a dataset specifically tailored for fashion analysis called Deepfashion. This dataset encompasses a collection of photos categorized by garment type such as denim and cotton, or style such as jeans, tie-dye t-shirts, or baby doll dresses. For instance, to identify which ones are 'jeans' among thousands of Instagram fashion photos, an ML model is trained from Deepfashion, and through algorithms and statistical methods, shown in point b. By employing the same dataset with various algorithms and statistical approaches, companies can analyze and predict trends and industry requirements throughout the management process from research to distribution with less human intervention. Figure 1, point a, illustrates how the model is trained.

The way a computer perceives visual data is different from humans; a photo is seen as a pattern arrangement of algorithmic numbers. AI understands numerical language or algorithms and it requires a dataset to learn. The more data is built into its programming, the more state-of-the-art the model becomes. In Figure 1, point a, the training set is used to generate a trained model. This model must be tested first to confirm if it can analyze data accordingly. This process is called machine learning. In point b, the model can recognize objects in a fashion photo; whether the object is skinny jeans or not, because the model receives input data (blue) and differentiates skinny jeans from other items such as shorts, midi skirts, or t-shirts. Then, as a result, the model can classify the photo as depicting skinny jeans (green). Programmers will often use benchmark models as a starting point and develop new algorithms from there. For example, an AI model for predicting upcoming fashion trends is developed based on object detection models, clothing categories, and classification models, as well as style prediction and clothing recommendation models. This development is only sometimes entirely novel but builds upon previous programming.

Digital Fashion and VTO

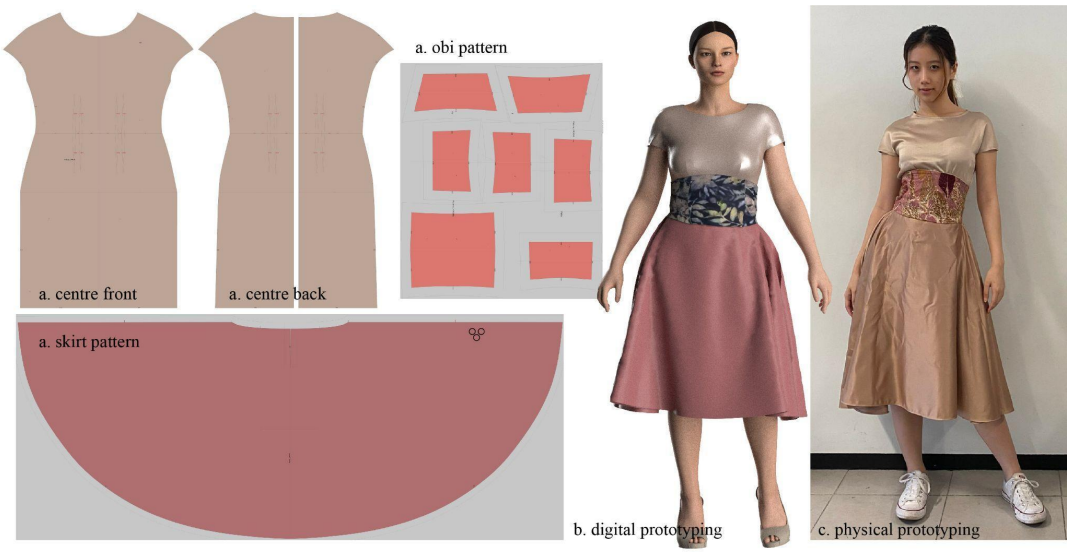
In the article above, it is explained that the style prediction and clothing recommendation model can be used in virtual try-ons (VTO), where AI assists consumers in selecting the clothes they want to buy without physically trying them on but through virtual visualization (Renaningtyas et al., 2023, 1-9). Some fashion brands utilize this technology by installing interactive mirrors in their retail stores. When consumers interact with these mirrors, they can instantly 'try on' clothing and find the right size before making a purchase. At the same time, AI analyzes feedback from consumers and uses it for marketing purposes or market research needs. AI can recognize the attributes of fashion products and retrieve related results. This can lead to consumers buying not just one product but multiple items through cross-selling efforts carried out by AI (Renaningtyas, 2023, 99-105), (Zou & Wong, 2021). AI recommends suitable styles for consumers while also predicting future fashion trends. VTO is also available directly on mobile phone screens through applications like Zero10 or DressX. 3D clothing is created using software and can be projected in augmented reality (AR) form. Users can interact as if they are wearing clothing or accessories like glasses, bags, shoes, hats, and jewelry. Quoting from the Zero10.ar website, the Zero10 app uses AI to map areas of the face for glasses placement or areas of the body for clothing placement. Several ML models are used to analyze visual content captured by the camera, whether a photo or video, to apply clothing realistically. For example, in photos with complex body poses; pose occluded with other body parts (Figure 4 b), or even photos with poor lighting conditions. Zero10 utilizes a dataset consisting of tens of thousands of labeled and annotated images, enabling it to add virtual clothing to a photo or video. AI is also employed in creating virtual models synchronized with 3D garments. AI generates numerous models with various inclusive body features such as facial expressions, hairstyles, body shapes, skin tones, shoes, and more. Each model is unique and can be customized to match the brand's DNA, whether they are sold in e-commerce or on social media.

Software platforms like Lalaland.ai or Ecoshot Metail are integrated with Browzwear through plugins. This integration can merge visual virtual models and 3D garments into life-like product presentations ready for sale. This visualization (see Figure 3 c) appears convincing to consumers when compared to Figure 2 b because the models used are not basic avatars but *scanatars* derived from scanned avatars. As quoted from Metail.com, a *scanatar* is a dataset developed by Ecoshot, consisting of 3D models scanned from real-life models' bodies. This dataset is processed by AI to create true-to-life product presentations. Realistic presentations

can be achieved through AI collaboration with various software and platforms, including editing product photos with tools like Photoshop, as demonstrated in Monika Sophie's work (Sophie L.R et al., 2023). Monika used CLO3D to create wardrobe photo shoots and leveraged AI to assist in the editing process to make the VTO composition appear more realistic.

Applicative Examples of Digital Fashion

Figure 2. Digital fashion design process



Digital Pattern of Vanya (a). Simulation of Vanya's outfit with fabric, color, and eco-print motif on the obi (b). Model wearing the final product from digital pattern a (c). Source: Community Service project by Luri Renaningtyas.

Digital fashion brands have been on the rise, especially since the notion of the Metaverse gained popularity in 2020. Previously, when fashion production was hindered due to physical restrictions, designers gradually began to design their products remotely from home with the help of 3D software such as CLO3D, Browzwear, Optitex, and more. It is viewed as both a new and potentially promising alternative, urging even well-established fashion brands to participate. In the Metaverse, 3D garments are showcased in virtual fashion shows and sold as NFTs (Non-Fungible Tokens), much like real-world fashion shows. 3D designers like Stephy Fung, BlancDeBlanc, The Fabricant, and major brands such as H&M, Louis Vuitton, and D&G are selling their NFTs at fantastic prices. Parallely, retail fashion brands are transforming into the digital realm, becoming virtual retailers, as seen with brands like b77life and Finesse. On the other hand, small-medium enterprises can surely join this euphoria along with the provided technology infrastructure, designers can create digital patterns using mannequin parameters and even human models from the physical world, as demonstrated in a community service collaboration with SME partner Naleni Kain in Siwalankerto, working together on a final project with Viona Krisentia to create a multi-look ready-to-wear (RTW) fashion called "Vanya" shown in figure 2. The digital sewing patterns for this ensemble, consisting of a sack dress, clock skirt, and obi belt, were developed using CLO3D. These patterns serve as master patterns that can be mass-produced by the partner in the future. In the development process, the avatar's size in CLO3D was adjusted to match the RTW mannequin's measurements, including chest circumference, waist circumference, center front, and center back. Additionally, references to measurement theories for Asian women

from various books on sewing were used. The creation of these digital patterns also involved an evaluation process by comparing them with the design sketches and physical patterns that had already been created. The digital pattern was then simulated to see the results, and if any discrepancies were identified, the digital pattern would be revised. This iterative process of evaluation, revision, and simulation continued back and forth between the physical and digital realms, creating an immersive and *phygital* workflow (Renaningtyas & Dora, 2023)

Hyperreality or representation of reality

Yasraf Amir Piliang's review of hyperreality and postmodernism, which refers to the theory of signs in his book titled "Semiotika dan Hipersemiotika: Kode, Gaya & Matinya Makna", explains the concepts of reality and simulation, the real, the representation, and the virtual. The theory of signs constructs the world of hyperreality. The word "hyper" in common parlance is interpreted as excessive, beyond, or surpassing boundaries. Hyperreality exceeds the boundaries of binary oppositions in language, such as signifier/signified, sign/reality, and physical/metaphysical. From the perspective of the theory of signs, hyperreality involves an attempt to expand or disrupt the order. Hyperreality does not prioritize meaning but only its external appearance and it is immanent in shaping hyperreality. It produces signs that do not necessarily have to be entirely new. The loss of the connection between the signifier and the signified, or concerning this topic, when the sign is no longer dependent on its reality in the real world. Why is this the case? According to Baudrillard in Freund, reality is deliberately recreated in the form of reality models (Freund, 2023).

Building on Baudrillard's theory, hyperreality is an environment of merged experiences, where the false blends with the authentic, and the engineered merges with the factual. Piliang discusses the evolution of technology, starting from the first generation that mechanically reproduces reality, such as photography, and then the second generation where technology is used as an extension of human capabilities, such as information technology, television, mass media, and technology without AI, as well as prosthetic limbs like cyborgs or cybernetic organisms (Nugroho, 2020, 6-9). In the next stage, technology becomes an extension of the human nervous system, where AI can reproduce realities that are limitless and more complex. Reality is simulated, and so is imagination (Freund, 2023)

Hypotheses

Viewing fashion design as an object of art examined through the study of signs, Piliang in his book in 2012 describes postmodern art using a dialogic model from Linda Hutcheon, which formulates this in two directions: horizontal and vertical. The horizontal direction is likened to a dialogue between the designer and the consumer, while the vertical direction is a dialogue between the designer and the materials for research and product development, such as reality, concepts, hallucinations, and imagination. This dialogue demonstrates the flexibility of art in the postmodern era, which, does not have to be rational, conventional, or normal. It signifies a shift in how art is defined in postmodern society. Based on observations on Instagram, the conveniences offered by 3D technology and AI are transforming the fashion industry's practices, both from the perspective of fashion designers and how consumers interact with fashion products. This transformation begins with how reality is interpreted.

Research Methods

The methodologies conducted in this research combine an explanation of applicative examples and theories of signs that challenge the notion of reality, whereas fashion design practice and its consumption fabricating by AI become the object of study. The applicative examples range from a community service project, research project, and teaching materials such as students' portfolios. The concept of realness is set out within the scheme of vertical and horizontal dialogues between signs and is primarily a semiotic analysis (Abikenov, 2022)

Results and Discussion

Concept of Realness

The explanation of the concept of reality in this article is based on Linda Hutcheon's division of sign relationships, which includes both vertical and horizontal dimensions. Vertical dialogue represents the interaction between the designer and their imagination, ideas, and research. In the R&D process, designers are expected to conduct market research, considering market trends as a reference point for developing their designs. Before the popularity of AI, research was done by physically immersing themselves in the market, conducting observations, and distributing surveys to the target market, and designers would gain real and realistic experiences. However, in the era of big data, designers or companies can instantly access information about trend projections and market preferences much faster and even more accurately. The vast data sets available on the internet, used by AI, achieve what Piliang terms 'folding time' or reducing time (Piliang, 2020). Data sets are programmed into algorithms, which become the models used by machines to recognize, analyze, and synthesize emerging trends.

Figure 3. Comparison of two different digital approaches.

Works by Ayrine Fluorensia and Clarita in their digital design prototype presentation created with Photoshop (a and b). Design presentation by Lisa Eriksson using Vstitcher with Eco shot plugin (c). Source: Metail.com.

If we consider that data sets are also signs, then data sets are signs of reality coded by programmers. A model of reality is transferred into numeric algorithmic forms that go beyond reality's boundaries. Referring to the concept of hyperreality from the theoretical analysis above, hyperreality models, rooted in the often non-new differences, can be analogized with how algorithms are created by programmers. Models are crafted through the recycling of previous ones. The principle of recycling is one of the fundamental

characteristics of hyperreality, as explained in the earlier literature review. This is relevant and makes sense when we view thoughts as signs that interact within the context of digital fashion, describing the concept of realness and underlining the profession of fashion designers and consumer interactions with fashion in this digital era. Digital platforms blur the boundaries between production and consumption, professionals and amateurs, physical and virtual, material and intangible, as well as object and image (Särmäkari, 2021, 85-114).

After the research phase, designers proceed to develop their products using 3D software. Vertical dialogue occurs between the designer and their designs when they are within the models of reality created by this digital technology. These models of reality include human avatars, models of human body size parameters, and models of fabrics like satin, jersey, or fur by inputting real parameters such as fiber weight and translating them into numerical values. There are also models of cotton fabric with fur, where the weight and the physical behavior of the fabric's fall are visualized as realistically as possible. Other models include body size, pattern cutting, and pattern modification. For instance, when a pattern is cut too short, designers can now extend it with a single click, eliminating the need to manually undo and redo stitches, thus saving time as Piliang stated becomes a multiplicity of time and space, the metaphor of time and space repetition, the concept of space and time going backward, forward, and pause. All of these models collectively represent the reality of simulation. They are simulations of finished products or digital prototypes. Visually, you can see the comparison between the 3D simulation and the physical production when they are placed side by side. The model of reality is compared with the actual reality (Renaningtyas, 2023, 99-105).

Figure 4. Comparing Realities

a. b. c.

Source: Output of community service and virtual fashion in Innofashion Show 2023 by Luri Renaningtyas.

The comparison above shows that the simulation still appears very much like a dummy (figure 4 c), retaining a 3D impression because it is worn by an avatar within a 3D environment background. This includes the poses, rendering of lighting, and other elements, where the audience perceives these signs as signs of 3D reality. However, when it comes to the shape of pattern cuts, the drape of fabric, and when the Vanya outfit is worn, it refers to models of reality. This digital prototyping aims to visualize the final result as closely as possible. If we compare these Vanya dress images, point a, an image generated by composing a 3D garment onto a photo of a real female body with Photoshop, image b produced by AR, and image c is completely 3D, it is easy to say that the picture a, imaging the most reality we

polarized to feel. Therefore, designers experience a reality that goes beyond, as if they can directly see what they have imagined, a simulation of fantasy (third-generation technology) engaging with various signs, whether from models of reality assisted by technology or signs from reality (experience, expertise), particularly in the context of sewing. This process offers an immersive interaction experience, transforming fashion into *phygital* or both physical and digital, as done by Phygital Twin and BlancDeBlanc . The line between actual reality and digital reality has merged, and designers go through a testing phase by producing their digital prototypes in the real world. If they feel their design needs to be evaluated, they can return to the simulation world to refine their design, back and forth, and so on. This is what is referred to as immersive. Fashion designers are no longer confined to physical reality but extend beyond hyperreality (Särmäkari, 2021, 85-144). Building on Piliang's discussion of the binary opposition in the world of hyperreality, which is often associated with what is visible or physical, this review emphasizes the relevance of connecting the physical with the real material world where clothing worn on the body can be felt and touched, while the metaphysical is associated with the term "Metaverse," which goes beyond the physical. 3D Digital fashion designers as stated above create fashion shows in the Metaverse that are compared to real fashion shows, highlighting the interplay between the physical and the digital.

The second dialogue occurs horizontally between consumers when designing a collection. VTO with AR or platforms like Lalaland with Machine Learning (ML) that estimate coordinates based on areas, such as the face, eyes, mouth, shoulders, and elbows, to attach virtual garments to photos or videos. Furthermore, AI smoothes the overall appearance to make it look realistic, similar to Lalaland with its scanatars. Therefore, these signs become a reality in themselves or simulacra of simulacra. According to Piliang, simulation is not a representation but rather signs within it seem to depict a realistic reality. The loss of the relationship between the signifier and the signified means that signs no longer depend on their reality in the real world. Reality is intentionally recreated in the form of models of reality, thus merging signs with reality, which typically occurs in simulations with the assistance of digital technology where signs and reality cannot be distinguished. Consumers then decide to purchase clothing products without touching them, feeling the material, or even physically trying them on.

Conclusion

This digital transformation redefines the design process for designers, shifting it from physical to virtual realms. It enhances consumer experiences through VTO in retail and on mobile screens. Furthermore, it opens up new possibilities for representation by creating various alternative designs that accelerate the perception of time and space. AI blurs the boundaries between what is reality and what is a model of reality, as seen in case studies like Metail or Lalaland. AI reformulates the design process, escalates consumer experiences, and expands avenues for representation and realness. As this digital revolution evolves, it will undoubtedly pave the way for the future of fashion, leading to more novel and inclusive approaches to design and consumption.

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