Selling Dreams Not Dressing:

In the AI Era Sustainable Fashion-A Photography Design Study

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ABSTRACT

Given the environmental crisis generated by fashion creation and communication, it is urgent to transform the current workflow towards a sustainable future. Research on sustainable fashion has primarily focused on promoting fashion design and production methods to reduce environmental impact. From the perspective of clothing design, we strive to solve material recycling issues and reduce consumption and resources by improving the various processes in the supply chain. The role of fashion photography has largely been ignored in the field of sustainable fashion despite playing an important role in current fashion communication.

This study aims to explore how AI generation tools can reduce the environmental impact in the fashion photography production stage and effectively convey virtual clothing and virtual scene shooting for sustainable brand designers. This study is based on the potential of AI software to reduce production costs, improve the time efficiency of advertising production, and facilitate the realization of sustainable design schemes. In this process, sustainable fashion clothing imagery is used to promote communication and iterations between fashion designers and photographers while meeting design needs and innovating visual effects. This research provides a novel fashion photography process for sustainable fashion brands. It helps reduce obstacles caused by an insufficient advertising budget that plagues many slow fashions and smaller-scale producers. Looking forward, AI fashion photography can contribute to the design stage and embed the visualization strategy at the beginning to aid waste and resource problems. This could reconcile the contradiction between visual effect creativity and production, achieving sustainable goals.

KEYWORDS:

Al generators, Fashion Photography, Sustainability, Digital Fashion

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TABLE OF CONTENTS

INTRODUCTION

Background

The fashion industry is regarded as a significant contributor to various social and environmental issues, adversely affecting the environment from production to consumer disposal (McNeill & Venter, 2019). According to the article of the 2030 Agenda, sustainable development proposed by the United Nations: responsible consumption and production. Sustainable Development Goals called for a shift to efficient use of resources and reduction of waste and urged consumers and producers to adopt sustainable practices (United Nations, 2015). In the field of fashion, it meant an increasing demand for moral fashion production that emphasizes responsible consumption and ecological integrity. The majority of fashion brands were reconsidering their production, promotion, and communication strategies to reflect sustainable and cyclical values, aiming to fit the changing expectations of consumers with environmental awareness and contribute to the global goal of responsible consumption. Slow fashion was beginning to be recognized by customers as a symbol of ethical fashion consumption.

Slow fashion promoted long-lasting products with transparent manufacturing processes, emphasizing quality over quantity. The slow approach was more than a direct contrast to fast fashion. The term encompassed sustainable fashion solutions that focus on redefining design, production, consumption, use, and reuse strategies (Clark, 2008). Despite the increasing focus on ecological and environmental sustainability, slow fashion faced several challenges in its growth. Based on Fletcher (2010), the confusion surrounding slow fashion often stems from rigid adherence to the traditional fashion model, which limits innovative thinking and reinforces existing practices, such as rapid production cycle, trend replication, low-cost manufacturing, frequent sales

promotions, and extensive retail operations. Current perceptions view the negative impacts of fast fashion as merely needing adjustments rather than radical changes. As a result, slow fashion was frequently repackaged within the existing framework as a marketing strategy rather than a transformative approach. Slow fashion companies were faced with issues that came from profit and were difficult to break through the impact of the development of fast fashion. That is how I came up with the idea of adding a sustainable concept from the very beginning of the creative process.

My ten-year career as a fashion photographer has deepened my understanding of the artistry and power of visual narration. I am always proud and excited to collaborate with a brand to create attractive and beautiful images and successfully convey the brand's information and aesthetics. However, after creating many activities, I began to critically reflect on the industry's broader impact. Although I value creative and commercial success, I am increasingly concerned about the impact of fast fashion on the environment and the unsustainable practices inherent in the industry.

As the fashion industry began to embrace artificial intelligence (AI), these technologies are starting to play a role in supply chain management. For slow fashion companies, this presented an opportunity to reduce costs associated with supply chain management. H&M Conscious Collection uses AI-powered data analysis to help minimize waste and overproduction by identifying trends related to environmentally friendly materials and design preferences (Candeloro, 2020). By utilizing AI, H&M successfully increased its brand value through its commitment to sustainability. Fashion advertising becomes a valuable method to convey those ideas to their customers.

Photography plays an instrumental role in the fashion advertising industry. However, notable deficiencies persist in integrating nascent technologies such as artificial intelligence (AI)

into sustainable practices in fashion photography. This study seeks to address the existing gap between fashion photography and the requirements of sustainable fashion by investigating the potential of artificial intelligence generators to assist fashion photographers in developing practical workflows that align with the principles of sustainable fashion and explore visual narratives that promote the concept of sustainable consumption. This study aims to reduce the environmental impact of slow fashion companies and design studios concerned about the environmental impact of the clothing industry. It is believed that although traditional photography can effectively convey the vision of sustainable development, the convenience provided by artificial intelligence tools can enable the innovative capabilities of visual workers to further amplify these advantages and implement the spirit of sustainable fashion in photography. Additionally, the field of creative practice provides new possibilities for creativity in visual communication.

This research project adopted a perspective on fashion photography, with a focus on ethical fashion needs and challenges. It also drew on AI technology research to explore ways of providing clothing brands and small-scale studios with sustainable fashion concepts that can reduce the cost of visual expression and facilitate the creative generation stage. The ideas and plans that have been developed and the current AI generator could engage any section of the production process. This creative process facilitated the transformation of abstract ideas into concrete images during the production of fashion advertisements. This resulted in a reduction of communication costs associated with inter-departmental collaboration, eliminated the necessity for repeated draft revisions, and accelerated the design decision-making process.

In the final stage of the practical process, AI served as a highly effective tool for assisting in the creation of images. In the initial stages of the creative process, AI could assist photographers in developing lighting and scene sketches to facilitate communication with the design department.

During the photographic process, AI could be employed to create scenes that align with sustainable ethics, approaches, and brand image, thereby reducing the cost of pre-production scene construction and providing a valuable reference lighting plan. Such specific lighting effects, when combined with the shooting scene, facilitated comprehension of the final film effect among other artists less familiar with the field of photography, such as stylists, costume designers, and designers, who could then provide their professional visual guidance. Specific opinions, such as the selection of key elements and color matching, reduce the cost of trial and error during the photographic process. This process extended the sustainability of products to downstream areas such as content production, thereby ensuring that sustainable, ethical products were produced under the requisite production standards for sustainable products from the initial creative idea through to launch.

Research Question

This study's primary research question is: How can an artificial intelligence generator assist fashion photographers in exploring novel creative avenues and visual narratives for sustainable fashion brands?

Furthermore, this research examines the design of AI-generated virtual dress-up workflows in conjunction with actual shoots, the advantages and limitations of AI renderers in the creative process of fashion photography, and the potential of these technologies to promote sustainability in fashion events. The research also discusses the dissemination of the concept and other potential problems.

The objective of this research is to examine the impact and challenges associated with the integration of artificial intelligence technology in fashion photography, particularly in the context of sustainable fashion. The objectives of this study are as follows:

(1) An evaluation of the role of artificial intelligence in sustainable creative exploration in photographic practice.

(2) A combination of artificial intelligence workflow with traditional fashion photography practice processes.

To achieve the objectives, a double-diamond approach is adopted. This study employs a literature review, case studies, and a questionnaire to relevant practitioners. This online survey aims to gain opinions from seasoned experts in the field of fashion design and related disciplines about the difficulties they encounter in their present workflows, enabling them to contribute their own experiences and collect their requirements for AI tools. This approach provides a current status and summary of how artificial intelligence is currently employed in fashion photography, as well as guidance for future applications.

This study initially undertakes a comprehensive review of the literature on the intersection of artificial intelligence technology, the sustainable expression of fashion visual elements, fashion photography, and the concept of sustainable consumption. It initiates a discussion concerning the manner in which these elements interact and evolve. Following a comprehensive review of the literature, this study demonstrates the potential of artificial intelligence in creating engaging visual narratives that resonate with consumers, as well as the opportunities and challenges in fashion photography practice, with practical examples. This investigation examines the influence of the

findings on the future practice of fashion visual storytelling and the impact of fashion photography on the production process in relation to sustainability.

LITERATURE REVIEW

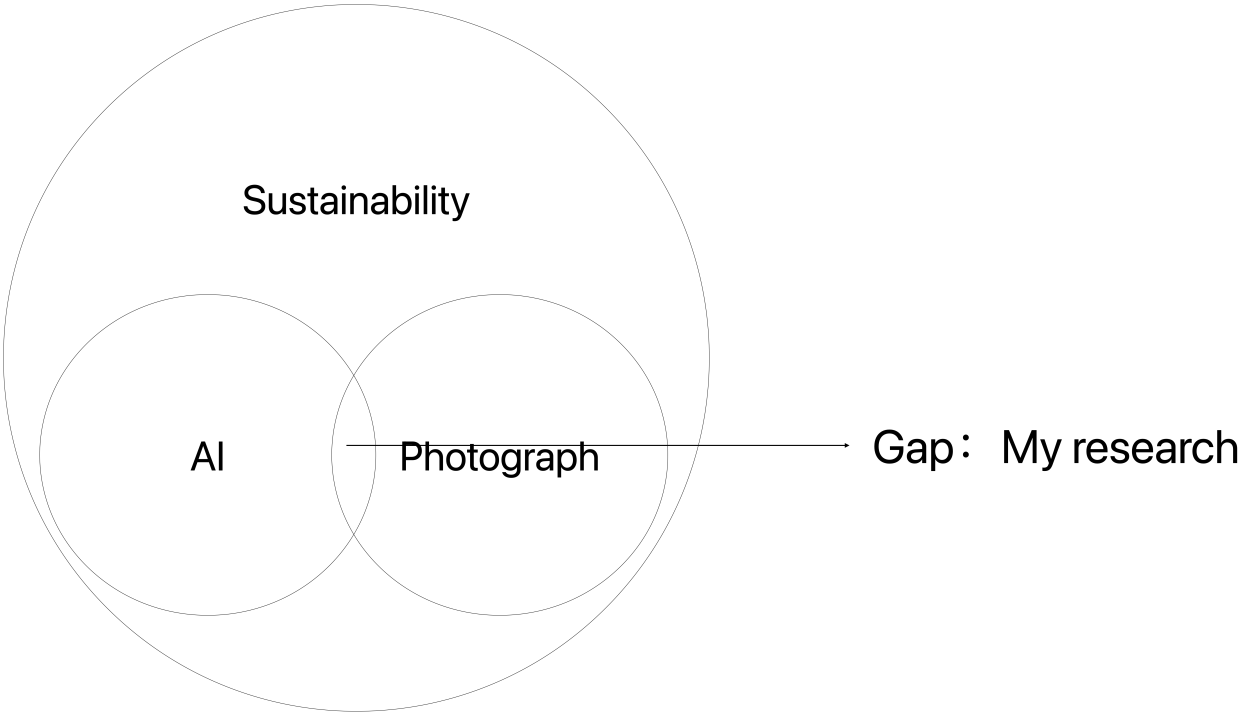


Figure 1. The gap in the research

Concept Introduction

This research came from my experience and perspective as a commercial fashion photographer who has been part of numerous international campaigns. I used to be a gaffer and post-production creator, which allowed me to observe the details of different production process sections. The resources consumed in the production process (studio, travel, equipment, printing) and the usually short product life cycle have caused major environmental problems. This concern prompted me to seek ways to combine my creative skills with my commitment to environmental sustainability. With the progress of technology today, AI products have become powerful auxiliary tools in the production field, improving the efficiency of resource allocation and resource

utilization, saving production costs, and reducing waste, such as using AI tools to assist zero waste material cutting (H&M Group, 2024).

At the same time, in the field of digital creation, the participation of AI products provides more possibilities for digital art, such as virtual photo-shoots, virtual live studios, 3D art, and other art forms. Artificial intelligence technology extends the boundary of artists' use of tools (Hung et al., 2022), saving the complex work that is used to require rendering and digital processing or at least a few days and months of labor (Zhou et al., 2019). Coupled with the cycle of modification and deletion, there are countless wastes of labor and energy in the current production process.

However, few people apply AI technology to the practice of making visual works with the goal of a sustainable future. While designing clothing products that conform to the concept of sustainability, AI visual strategies that adhere to the sustainability concept could be added from the design stage. This may aid in minimizing communication barriers between designers and photographers and the waste of production resources and manpower in the advertising production stage. In this way, a new workflow can be formed to meet the requirements of the concept of sustainable clothing in the creative stage. This is not only to save money but also to make a positive contribution to creating a more ethical and environmentally responsible future for the fashion industry. Although AI presented exciting opportunities to improve sustainability in the fashion industry, it was important to recognize the risk that these procedures might be abused for greenwashing, a practice in which flimsy assertions of environmental responsibility conceal a lack of real change.

Evaluation of Previous Research

1. Application of AI technology in the fashion field

At present, the application of AI technology in the field of fashion design occurs mainly through two aspects: design innovation and production optimization. On the design side, the participation of the AI-driven system in the design system has significantly improved creative efficiency. For example, the AI-driven system was especially useful in textile dyeing, offering solutions for color matching, fault identification, and color formula prediction. To decrease human error and increase accuracy, technologies like artificial neural networks (ANN) and adaptive neural fuzzy inference systems (ANFIS) could estimate color intensity (K/S) based on process factors (Sharma et al., 2023). In the production process, achieving 100% mistake detection accuracy, technologies like image processing and neural networks might increase worker safety, productivity, and fiber recognition rate (Vermeulen et al., 2021). Additionally, the current virtual fitting technology combined with 3D body scanning data has reduced the production of e-commerce samples by more than 50% (H&M Group, 2024), effectively alleviating the inventory backlog caused by fast fashion. According to McKinsey's State of Fashion 2023 (2022), the current investment in AI fashion mainly focused on supply chain optimization and demanded forecast, and only a small part of the investment involved sustainable innovation.

The value of AI in the field of fashion design was measured by economic benefits (Wallenberg & Kollnitz, 2023). Although AI technology improved the utilization rate of fabrics, it was not related to the sustainability of materials. The use of AI tools by fast fashion increased the sales of goods, reduced production costs, and increased the profits of enterprises, but it still lacked a consideration of a sustainable future. In the future, it should be important to think about how AI might be used to solve these environmental issues and produce fashion more responsibly.

2. Analyze the specific application of AI technology in fashion photography

AI has significantly improved the efficiency of photography in the practical stage, especially lighting diagrams and virtual backgrounds, and also provided a significant method to help with post-production and brought innovative methods. Through automatic image generation and intelligent optimization, AI could quickly build creative concepts, help photographers collect more accurate visual inspiration, and build sketches of lighting atmosphere in the early stage of creation, thus saving a lot of time (Bain & Company, 2023). In post-processing, AI reduced repetitive and monotonous labor through the advantages of the algorithm and greatly shortened the retouching time and learning cost required for the traditional process (Jesse, 2024). AI showed many advantages in efficiency and convenience, but it might still lack humanized artistic expression in creation.

Deep learning was essential to the advancement of AI in the field of photography. Model training is the main process. The calculation of carbon dioxide emissions during model training was the primary focus of the early research on the environmental effects of AI models. According to the study (Strubell et al., 2020), 626,155 pounds/284 tons of carbon dioxide emissions—roughly equal to the lifetime emissions of five automobiles (including fuel)—would result from training a large language model (LLM) with 213 million parameters. Using the calculator from ADGREEN, we could estimate a 3-day (2-day preparation, 1-day on set) traditional fashion photography shoot, including 10 people's flight tickets from Beijing to Shanghai, consumed 7.07 tons of carbon emissions, with an average of 2.36 tons per day.

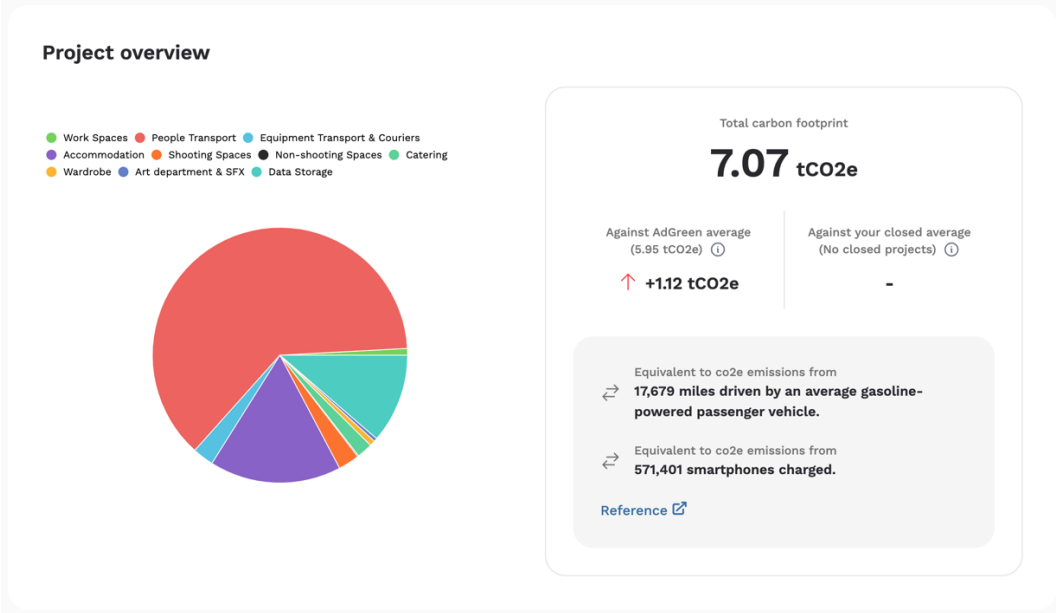


Figure 2. Carbon emission in the process of a 3-day commercial shooting, generated by ADGREEN.

Nevertheless, model training only took place at the beginning of a virtual photographic process, and the whole task relied on the integration of mature models, requiring just network bandwidth and personal computer resources. Simply, it was comparable to an ordinary post-production process.

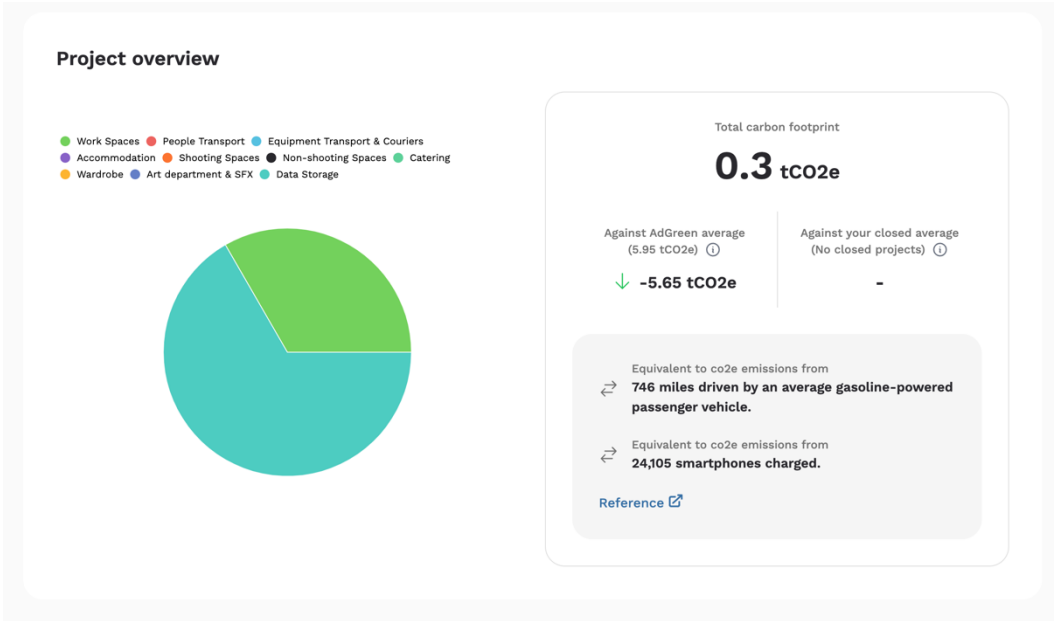


Figure 3. Carbon emission in the process of a 3-day postproduction, generated by ADGREEN.

Therefore, resource consumption is decreased when AI is used in the fashion photography production process. However, further research is required to evaluate consumption overall.

The current research on the application of artificial intelligence in fashion photography has three key limitations: first, the lack of a systematic, sustainable assessment framework. Existing literature mostly focuses on efficiency improvement indicators (such as time-saving rate and cost reduction) but ignores the evaluation of resource consumption caused by AI technology in promoting fashion image information production. For example, the training energy consumption of models such as stable diffusion (about 1287mwh/time) and the electronic waste generated by hardware iteration (3.2kg/GPU) are rarely included in the research scope (Luccioni et al., 2024). Secondly, there is a gap between technology application and sustainability goals. This efficiency-oriented technical standard may aggravate the overproduction of fast fashion goods. Finally, the lack of interdisciplinary integration limits the practical value of the research. Most of the existing achievements start from a single technical perspective and do not analyze the impact of AI technology on sustainable fashion photography communication from the perspective of overall design, production, and customers' requirements.

Precedent Review

1. Sustainable design drove in AI applications and production: re-imagining the origin of fashion

Rethinking the idea of sustainable fashion from the beginning of the creation of clothing, including design conception and production processes, was essential to developing a strong logic for sustainable fashion. Artificial Intelligence (AI) should not be viewed merely as an optimization

instrument but rather as a transformative catalyst capable of re-evaluating established fashion paradigms and formative processes. In an era characterized by pressing ecological imperatives, AI possessed the potential to reshape the structural framework of the fashion industry from its foundational elements, thereby projecting a path toward genuine sustainable industrial development.

The traditional fashion design and production mode was characterized by linear process and resource-intensive practice, which was in sharp contrast to the principle of sustainability. AI provides a powerful means of change, which could inject reducing production costs and rising efficiency into the core of fashion creation. For example, Guo and Wong (2011) explained how AI algorithms could analyze huge datasets and forecast demand with unprecedented accuracy to minimize overproduction - the main source of waste in the industry. Rathore (2023) pointed out that the latest research on the application of ChatGPT showed that it could support the sustainable management of the fashion supply chain, provide suggestions for textile companies on how to optimize water management, recommend more sustainable production processes, identify abnormalities in the production line, and guide opinions on the company's environmental impact. This prediction ability was not limited to prediction, it also affected the fashion production process and reduced the environmental burden to a minimum amount.

In addition, AI was not only about optimizing the existing production process, but it also generated new ideas and material possibilities. In sustainable design, AI could be an innovative partner to assist designers in exploring and implementing environmentally friendly materials. For example, the Material ConneXion platform used AI technology to help designers retrieve and discover sustainable materials. Designers could search for various eco-friendly materials according to their specific needs, and AI could provide recommendations based on the characteristics of

materials and application scenarios (McCarthy, 2022). AI could screen complex data such as material properties, environmental impact, and life cycle assessment. This enabled designers to make considered choices, minimize ecological hazards without compromising aesthetic experience or functional integrity, and provide new clothing aesthetic possibilities.

These changes enable sustainable manufacturing models and technology-driven future directions to challenge the traditional "fast fashion" approach characterized by resource-intensive, large-scale production. AI technologies have become the cornerstone of sustainable development, from their usage as the foundation for boosting business profits to their reconstruction of the fashion manufacturing process based on sustainable development.

From another perspective of visual advertising creators, it is important to recognize that the AI-driven transformation in design and production has a profound impact on visual representation. As the fashion industry fundamentally has embraced these sustainable methods, the narrative of fashion itself is also evolving. The visual language and expression of fashion photography should improve alongside technological advancements to reflect and convey sustainability as a core value. The aesthetics of fashion imagery could draw inspiration from sustainable creation, which in turn can help better disseminate the concept of sustainability.

2. Virtual Try-On (VTO) Technologies and Their Impact on Sustainable Fashion

VTO technology represented an important change in the development of the fashion retail industry. It not only provides a new technology but also has the potential to change the approach to consumption. The fashion retail industry has been significantly transformed by the Internet, dramatically reshaping consumption behaviors. Understanding the new technology of VTO could help the fashion industry to provide a more sustainable sales model. This element was important

because it fundamentally changed the relationship between consumers, clothing, and images. These technologies used augmented reality (AR) and 3D modeling, which went beyond simple convenience (Kornilov, 2025). They have made great changes in the way consumers participate in digital fashion. These changes might directly affect purchasing behavior and have environmental consequences.

One of the most notable benefits of VTO is that it could reduce the environmental burden related to e-commerce. From the retail point of view, due to consumer size differences and the failure to meet fit expectations, a high return rate was widespread, leading to logistics emissions and textile waste (Cullinane & Cullinane, 2021). VTO technology aimed to enhance consumers' confidence in online purchase decisions through the realization of a virtual "try-on" experience. Applying this process could significantly reduce the number of product returns (Hwangbo et al., 2020).

From the design point of view, Levi's, an American manufacturer, has used 3D simulation technology to check the fit during the production of clothing samples because it has the advantages of fast speed and low total production cost, and in the near future, its use may further penetrate the market. Elaine Hamblin, technical development manager of Levi's global innovation and research department, was currently trying to design with virtual try-on technology. This kind of try-on technology also improved communication among designers, plate makers, and technical designers (Salmon, 2014). Because most of the production has been carried out overseas, and the fitting process has also been carried out in multiple locations around the world. It was difficult to create a consistent fitting effect in different locations, and it was also difficult to provide feedback on any problems and inconsistencies of the prototype to the suppliers of clothing production (Song & Ashdown, 2010). According to a report by Salmon (2014), the 3D simulation technology in virtual

fitting technology shortened the time of the costume design process by two-thirds because the technology allowed garment manufacturers to make fewer physical samples for each garment before production, and it was reduced from the previous average of three to five samples to two samples. When the sample production was carried out overseas, the advantages of 3D simulation technology, “speed,” and “total cost reduction” would be greater because the number of real prototypes that needed to be sent back and forth would be reduced.

From the perspective of consumers, the interaction and customer participation created by virtual fitting can improve the entertainment value of the online shopping experience. It also provided an opportunity to promote the spread of sustainable fashion within the scope of consumers in the way of consumption. According to Moon et al. (2014), in the process of purchasing clothes made of sustainable materials, most consumers would be willing to pay a more expensive premium than ordinary clothes, which also expresses their concern for the concept of sustainability.

VTO provided the opportunity to minimize the impact of visual production on the environment by reducing the dependence on physical samples and reducing the production cost of enterprises. However, it also exacerbated the virtualization of fashion images and broadened the channel for consumers to buy more “fitted” clothes. If we do not use this tool carefully, it is possible to expand the waste of resources such as fabrics and textiles from the consumer side. There is no conflict between the fashion concept and the environmental protection concept. The focus is on how to balance the relationship between the two and establish a benign market guidance.

3. The role of photography in spreading sustainable fashion:

Photography is a key tool for communicating brands' values and ideals in the emerging field of sustainable fashion. The field of sustainable fashion is not only about applying existing visual techniques to new themes but also about a fundamental rethinking of the photography project itself. In the context of ethical and sustainable product requirements, photography should go beyond its traditional function of creating images for commercial purposes and assume the key responsibility of visualizing and narrating sustainable fashion communication. As a photographer, defining the "role of photography" requires a holistic approach, that is, thinking about how image technology can assist creative execution from sustainable clothing design to creative implementation and fully meeting the requirements of sustainable development from idea to practice. It entails looking at how photographic images can effectively:

(1) Express Ethical Values

How can photography go beyond simply showcasing clothing and visually embody the ethical values inherent in sustainable fashion, such as fair labor practices, transparent supply chains, and responsible resource use? This involves exploring visual strategies that convey the integrity, traceability, and human factors behind sustainable production. For example:

Patagonia

"Don't Buy This Jacket (2011)" Patagonia posted a photographic advertisement of their Regulator jacket in the New York Times titled "Don't Buy This Jacket," encouraging consumers to think about the effects of their spending on the environment before buying their Regulator jacket. This promotion supported Patagonia's brand values and approach to sustainable fashion.

"Announcing Worn Wear (2013)" encouraged customers to repair, reuse, and recycle Patagonia clothing to extend its lifespan and reduce waste. The company also offered repair services, online guides, and even mobile repair stations.

"Fair Trade CertifiedTM - Patagonia (2014)" highlighted a commitment to fair labor practices by showcasing their Fair-Trade Certified products and the positive impact on factory workers' lives.

These campaigns from Patagonia were more than simply marketing tactics; they were an essential part of their brand identity and a true representation of their moral principles. Patagonia built a solid brand name and a devoted following of customers that place equal importance on ethics and product quality by continuously advocating for environmental stewardship, sustainability, fair labor, decreased consumption, and activism. Their advertising efforts were a potent illustration of how companies may utilize their influence to promote constructive change and encourage moral consumption.

(2) Building an ecological narrative

Sustainable fashion is intrinsically linked to environmental issues. Photography has the potential to visually transform complex ecological narratives – from material sourcing and production processes to the environmental impact of fashion consumption – into compelling and easily understandable images. This required innovative methods to visualize abstract concepts such as carbon footprint, water consumption, and waste reduction in a way that resonates emotionally and intellectually with the audience. For example:

Stella McCartney

“Fashion Manifesto” and Sustainability Reports**:** Stella McCartney's “Fashion Manifesto” (Stella McCartney, n.d.) produced regular sustainability reports by using artistic photos to provide detailed information on their environmental performance and goals.

Projects that visually tracked the life cycle of clothing (from raw materials to disposal) or activities that juxtapose fashion images with environmental impact images all reflected this approach.

(3) Adopting sustainable practices in production:

It is crucial that this research also considers the internal sustainability of fashion photography. As visual creators working in this field become increasingly aware of their impact on the environment, fashion photographers must rigorously examine their production methods. This includes exploring sustainable studio practices, digital workflows to minimize physical waste and ethical sourcing of materials and resources for photographic production.

During the creative phase, images must serve as a medium for conveying ideas and engaging in creative discussions. In the process of design creation, the impact of the information carried by images on consumers cannot be ignored. At the same time, as designers, we should also consider the value and emotional needs of sustainable products from the beginning of creation to the end of the process when they reach consumers, starting from all aspects of product design. This is not just a consideration of specific interests, but also an important factor in building a sustainable society in the future.

METHOD

The primary question of this study explored using a mixed-method approach: How can an artificial intelligence generator aid fashion photographers in discovering new creative avenues and visual narratives for sustainable fashion brands?

To reach my research aims, this approach was broken up into three sections. First, from a photographic standpoint, the "double diamond design" method investigated the context for sustainable fashion research and the creation of AI-based Virtual Try-On (VTO) applications. Second, to learn more about the views and requirements of professional designers and fashion photographers with regard to AI and virtual try-on capabilities, my research used an open-ended online questionnaire. Thirdly, to further verify the research results and demonstrate the actual potential of AI generators in sustainable fashion photography, I created and applied AI VTO generators to show specific "changing clothes" functions and develop visual concepts for Stella McCartney. This practical application was the tangible result of the research, which explained how to directly use AI to create innovative and sustainable fashion images. At the same time, according to the experience summarized at this stage and the data collected from the survey, a new workflow meeting the requirements of sustainable fashion is formed.

Double Diamond Design Process for AI Application Exploration

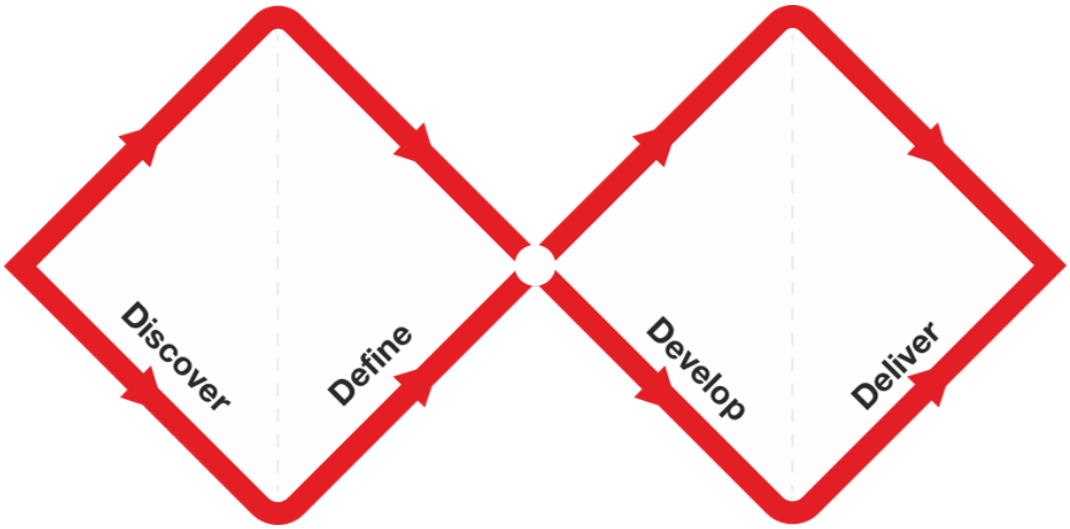


Figure 4. The model of the Double Diamond process, made by Design Council.

(Design Council, n.d.)

To explore the potential of artificial intelligence generators in assisting fashion photographers in the field of sustainable fashion, this study would adopt the Double Diamond design process framework. Double Diamond was a widely recognized design method that provided a structured approach to problem-solving and innovation in the field of design, involving four distinct stages: discovery, definition, development, and delivery (Design Council, n.d.). This framework was highly suitable for this study as it allowed for both divergent and convergent thinking, seamlessly integrating divergent creative ideas with logical, in-depth research while maintaining a focus on specific practical guidance and sustainable requirements.

1. Discovering stage: This initial stage involved extensive exploration and research to understand the status of AI generators and sustainable fashion photography.

(1) Expansion of literature review:

In this stage, academic literature and industry reports on the application of artificial intelligence in the creative industries were collected, with a particular focus on sustainable practices between AI-driven image generation and fashion activities.

(2) Technical exploration:

I then explored various AI image generators to understand their limitations and potential in fashion photography. This involved testing different AI models, prompts, parameters, and their applicability to sustainable fashion narratives. Specific AI generators were explored, including Midjourney and Stable Diffusion.

(3) Case analysis:

The existing advertisements of sustainable fashion brands were analyzed to understand current trends and innovation opportunities. Visual promotional activities of brands recognized for their sustainability efforts, such as Stella McCartney and Patagonia, were collected.

2. Definition Stage: In the framework of sustainability, this step concentrated on identifying creative potential and difficulties for AI-assisted fashion photography.

(1) Subsequent investigation:

This involved fine-tuning study questions for the initial investigation and pinpointing certain domains in which AI might best support fashion photographers in advancing sustainable fashion. More focused issue statements like "How to use artificial intelligence to generate visual narratives that meet the requirements of sustainable fashion?" might result from this. This involved listing the precise requirements for sustainable fashion communication. These innovative concepts would act as a framework for further AI research as it progresses. "Demonstrating sustainable materials" and "Promoting sustainable consumption concepts and resonating with consumers" are two examples of creative topics.

(2) Specify the assessment standards:

This involved providing precise criteria for evaluating the originality and efficacy of AI-generated visual effects in promoting sustainable fashion principles. These standards might include "technical feasibility," "visual appeal," "sustainable, ethical production requirements," and "brand consistency."

3. Development stage: This was the stage of iterative prototyping and experimentation. An AI generator would be used to produce a set of photos that satisfy sustainable fashion standards and brand concepts using the imaginative notions established in the previous step.

(1) AI-driven picture generation:

Using different prompts, styles, and settings to develop sketches that correspond with creative thoughts by conducting methodical tests on a few chosen AI generators. The prompt engineering methods would be recorded and improved during this procedure.

(2) Iterative improvement:

Based on my data collection, I would refine my AI generator to fit those designers' and photographers' requirements. The aim was to increase the originality and comprehensiveness of visual effects while following the guidelines specified in the creative idea, evaluate AI outputs according to predetermined evaluation criteria, and make iterative improvements to prompts, parameters, and AI models.

(3) Record and Analysis:

A thorough documentation of the artificial intelligence experimentation process, including the models evaluated, the prompts utilized, the visual outputs produced, and a critical analysis of the benefits and drawbacks of AI-assisted techniques.

4. Delivery Stage: The last stage would clarify the possible uses and effects of AI on sustainable fashion photography. Based on my data collection, I would summarize a new workflow that might help designers create sustainable products and reduce the cost of visual production.

(1) Creative Visual Presentation:

Highlighting artificial intelligence-generated visual effects and their potential to produce stunning images and communicate the idea of sustainable fashion.

(2) Description of the working flow:

Create a new workflow for fashion designers and photographers who want to successfully use AI generators in the production and promotion of sustainable fashion. The double diamond method and AI experimentation have yielded important processes, factors to consider, and best practices that will be outlined in this framework.

(3) Overview:

I address the research questions and talk about the findings' wider implications for this new field, which requires much more research and development. The study's limitations and opportunities for more research are reflected in the conclusion.

Attitudes and Demands Data Collection Questionnaire

I created a questionnaire survey to supplement the exploratory design process and obtain opinions from experts. The purpose of this survey was to gather information on the attitudes, beliefs, and needs of fashion photographers and designers concerning the application of AI generators in environmentally friendly fashion photography and establish an evaluation standard for design results based on the obtained answers.

1. Participants: With a planned total sample size of 40 and an actual sample size of 30, this survey would focus on two primary participant groups.

Participants were required to be designers and photographers in both New Zealand and China who had comparable backgrounds and knowledge of fashion or relevant field techniques. Emails and online communities from my working social media group will be used for recruitment. To provide professional insights into the practical application requirements and perspectives of artificial intelligence in this field, I thoughtfully selected four designers and two photographers with substantial backgrounds in fashion or related design areas, particularly those with over five years of industry experience.

2. The questionnaire adopted two types of questions, multiple-choice questions, and open-ended questions, with a total of 19 questions:

(1) Multiple-choice questions:

The multiple-choice questions gathered statistical data in order to learn more about participants' prior knowledge and familiarity with AI technologies and eco-friendly fashion. They addressed topics such as “use of AI tools in photography/design workflows,” “experience in sustainable fashion photography,” and “How would you rate your knowledge of AI.”

(2) Open-ended questions:

These provided the opportunity for participants to share their needs, worries, and innovative ideas about the application of AI generators in sustainable fashion photography. The following themes were covered in detail by participants answering this open-ended question: “Creative opportunities for AI in sustainable fashion photography,” “What do you think are the strengths and weaknesses of that AI software?” and “What are your thoughts on AI technology in the fashion industry, specifically around fashion photography and advertising?”

(3) Data analysis and overview:

The percentage of responses in multiple-choice questions was analyzed to find patterns in attitudes and opinions. The replies to open-ended questions were compiled to identify the needs and views shared by the majority of this group. According to my results, over half of the participants had not heard of VTO before. However, those who used AI software exhibited a strong preference for this function in practical applications.

Research and Practical Application Based on Design: AI VTO generator and Stella McCartney Campaign Concept

Based on the developed AI VTO generator and the insights collected from the Double Diamond process and questionnaire survey, the concept of the campaign was specially created for Stella McCartney. Stella McCartney was selected as the design blueprint because the brand is committed to sustainable and moral fashion practices, making it an ideal environment for exploring AI-driven sustainable visual communication.

DESIGN PROCESS

AI VTO generator development and “changing clothes” function demonstration:

The main objective of this stage was to show how AI-driven virtual try-on (VTO) generators could be used to “change clothes” from a fashion photography perspective, which satisfies the evaluation standard of fashion photography. Users could use AI to “change” or virtually change various aspects of fashion photography in the photo image, such as “AI generates virtual models,” “realize the replacement of virtual clothing,” and “change the lighting effect of photography.”

Technology selection and implementation:

Picking a suitable AI image generation platform or plug-ins that could process images and perform VTO functions. The platform chosen for this study was Stable Diffusion and Midjourney, and the model FLUX and Midjourney V6. These two platforms served as the foundation for this study since they may be used as graphical and cultural maps. The community encourages the usage of plug-ins or prompt phrases to do pertinent tasks, and updates happen quickly.

These tools relied on two basic AI concepts, namely image-to-image and text-to-image production. With text-to-picture technology, an AI model was given a written description, or “prompts,” and used its acquired knowledge of language and visual information to create a similar image. This was expanded upon by image-to-image generation, which allows for tweaks and stylistic changes by using an existing image as input and changing it in response to a fresh text prompt or additional image input.

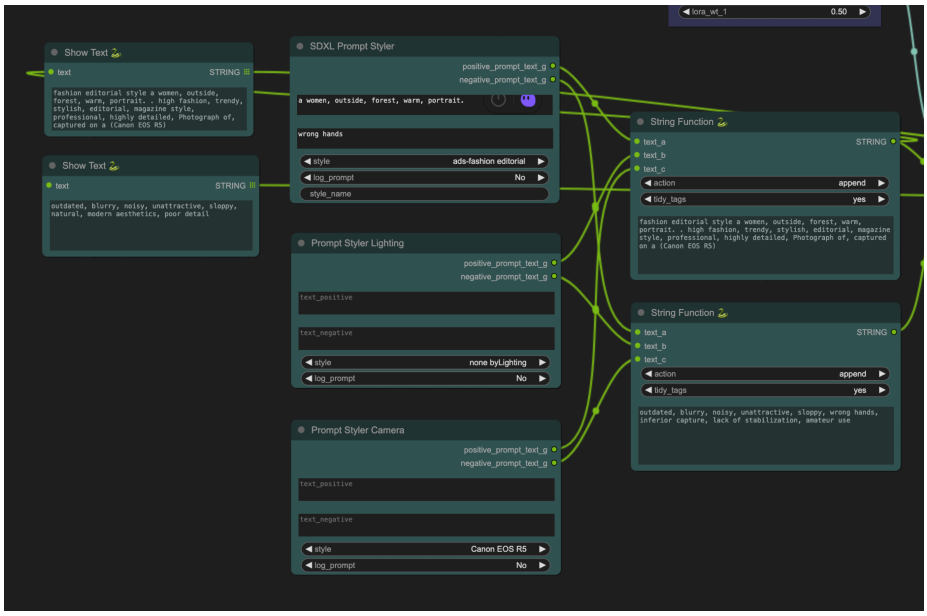


Figure 5. Prompt Interface, Comfy UI, Tianyi Wang created.

The selection of foundation models was essential in these platforms as they supply the fundamental information needed to generate images. Additionally, by using LoRA (Low-Rank Adaptation) models, the AI's output would be adjusted to accomplish particular artistic consistencies, such as guaranteeing that virtual models appear consistently across the campaign imagery.

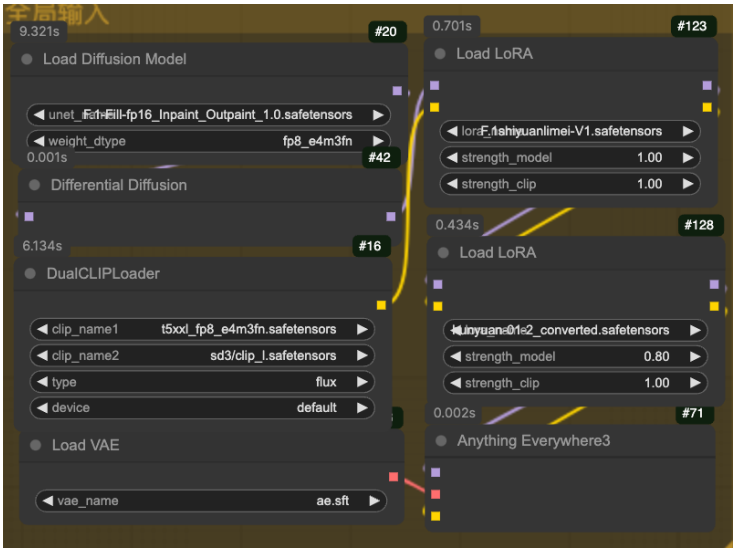


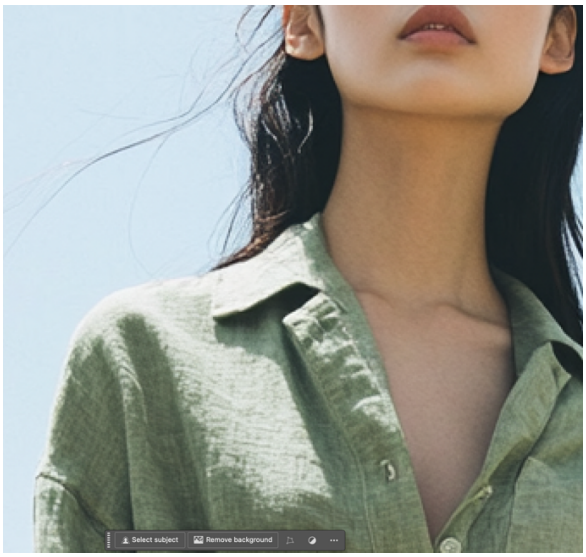
Figure 6. Model Interface, designed by Comfy UI, Tianyi Wang created.

Based on the above two basic functions and related plugins, the function of changing clothes could be achieved.

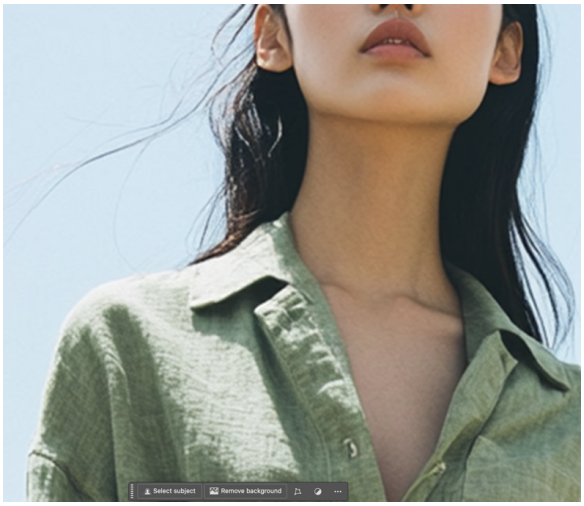
Figure 7. VTO Function Demonstration, Comfy UI, Tianyi Wang generated.

Eleven people indicated that they would want to use the virtual try-on option based on the survey replies I got. Additionally, 72.7% of respondents who required this function think that this function is necessary to fulfill the demands of creating clothing samples and assessing the outcomes of design.

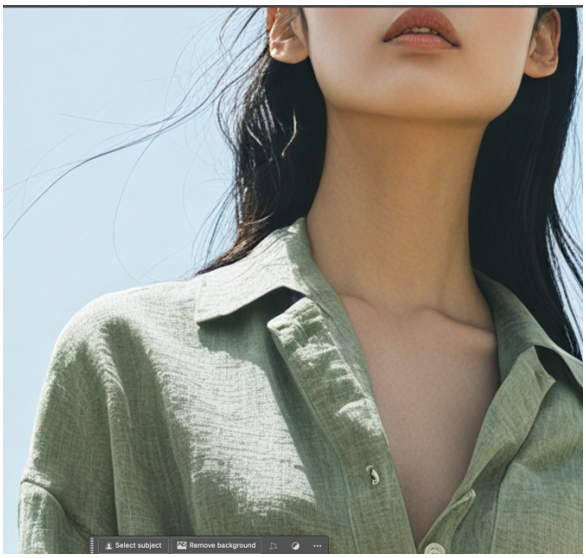
Three fashion designers specifically pointed out that although virtual try-on products currently available on the market can be placed on models, the lack of texture would result in a loss of accuracy in material representation. Due to hardware limitations, the images produced in AI-generated virtual dressing functions are often smaller. Therefore, I used three different ways to enlarge the same AI-generated model sample image to prove the practicality and necessity of the enlargement function in AI fitting. For this comparison, I used a unified image format and compared the same cropped parts in the images.



Original Image



2X Expanded by Photoshop



2X Expanded by AI---SUPIR Model

Figure 8. Upscaling Function Demonstration, Screenshot, Tianyi Wang.

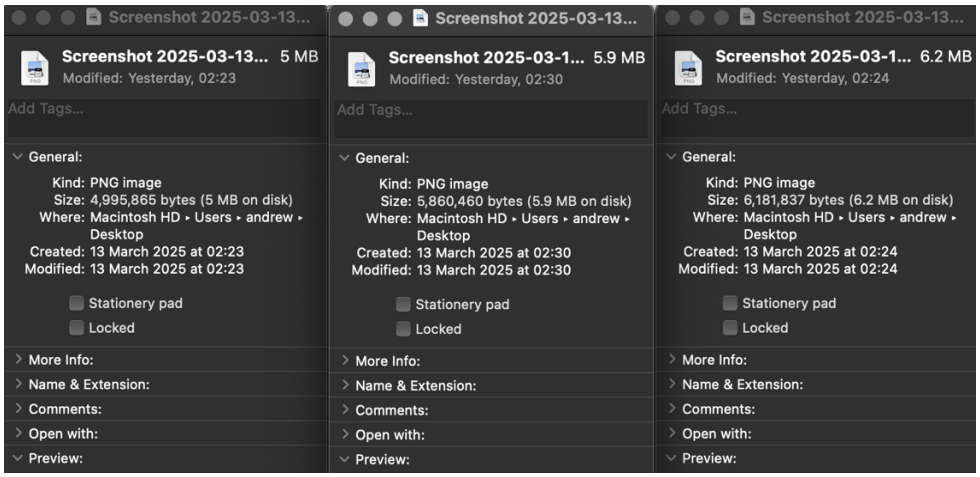


Figure 9. File comparison, Screenshot, Tianyi Wang.

Original Image 2X Expanded by Photoshop "SUPIR" Model

Also, 70% of the respondents believed that the process of setting the lights and scenery was very frustrating in the traditional photography production process. This was also where the majority of respondents believed that expenses were unaffordable and unavoidable. I also incorporated the function of using virtual lighting design to achieve lighting effects for real studio photography in this workflow design. This function was based on a model called IC-Light.

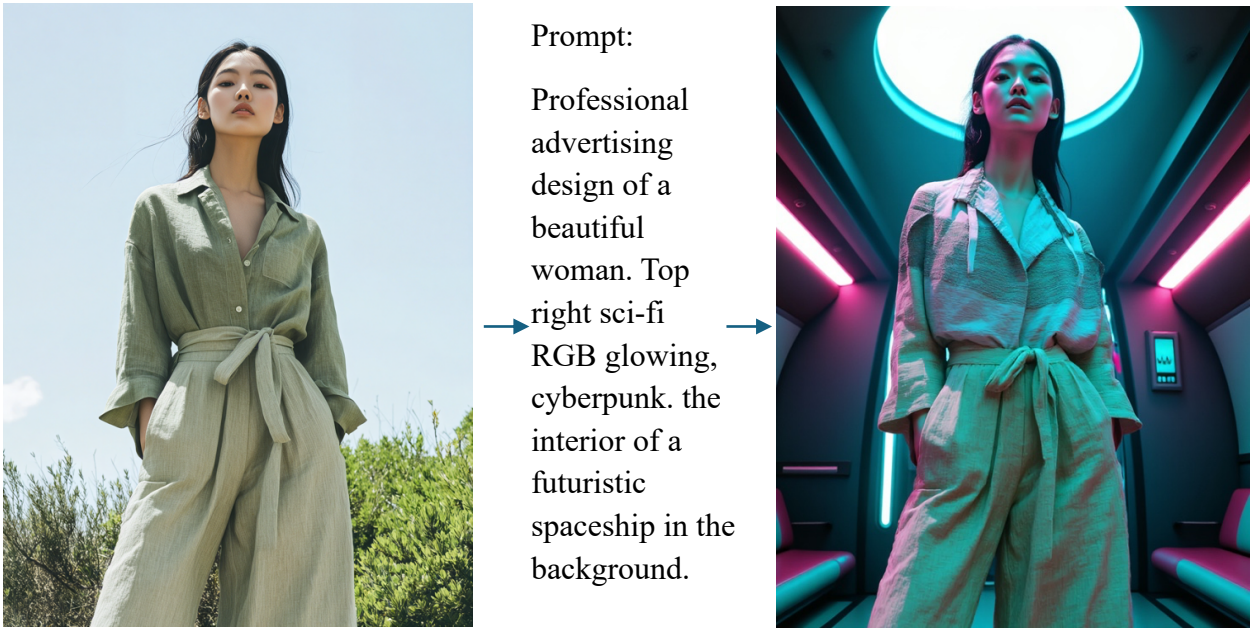


Figure 10. Lighting Repaint Function Demonstration, Comfy UI, Tianyi Wang generated.

This feature could rely on prompt words and existing light directions to change the lighting effect. This design could be effective in all three stages of visual presentation, reducing the cost of background production in the early stage and reducing communication barriers between the visual and creative design departments. It also avoided repeatedly adjusting lighting during the shooting process, prolonged production time, and increased the possibility of secondary creation in the post-production stage. This feature allowed creators to focus more on content creation, reducing physical labor and the mental exhaustion caused by repeated changes.

This method of combining text and images to control the preview of image effects only required a very simple description of the scene and lighting effects in the text, which could provide more possibilities for creators of different professions. While exploring the functionality of AI VTO, I also utilized the "ControlNet Union" model to explore from a sketch to a draft photograph. It only took me one minute to create this draft photograph. Even though I am not good at drawing.

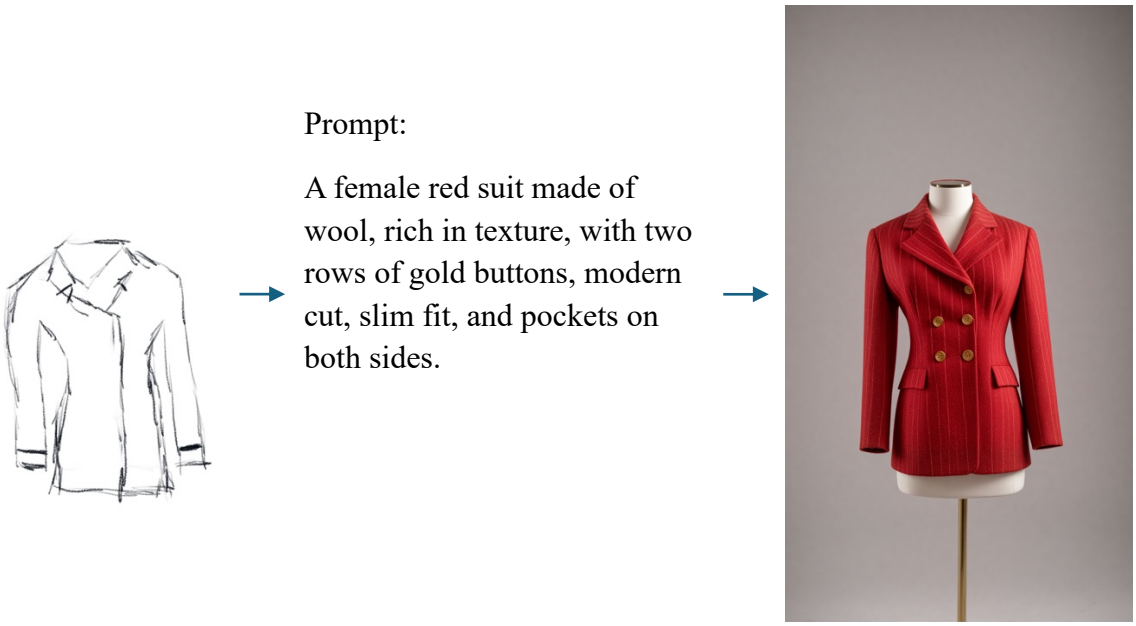


Figure 11. Sketching generated Function Demonstration, Comfy UI, Tianyi Wang generated.

Design Outcomes - Stella McCartney Campaign Concept

For the 2035 Stella McCartney autumn winter series, the theme was “The Conscious Couture”. This theme aimed to emphasize the importance of harmonious coexistence between humans and nature and highlight the concept of sustainable development. The theme tone used a warm natural color range, such as warm white, brown, and warm yellow, to arouse awareness and attention to the natural environment.

To fit their brand image, I realized her design of clean lines, fitted silhouettes, and subtle yet elegant styles are common in her creations. And refusing to use designs that are too cluttered or elaborate (Made With Love by Stella McCartney Wedding Dresses, n.d.).

For the materials, I used ChatGPT as an assistant, which helped me to realize the trend in this field. To be honest, I lacked this type of knowledge. I picked two kinds of materials as the key elements in my design. The first one was “Frayme Mylo,” a mushroom leather, and the other was plant-based wool. Stella McCartney has already used this for the handbag in 2022 (Stella McCartney, 2022). More sophisticated and adaptable varieties of mushroom leather will be anticipated in 2035, possibly being utilized in purses, jackets, and even more elaborate clothing embellishments. Second, plant-based wools addressed the need for warm, cozy textiles suitable for colder seasons while avoiding the environmental impact and animal welfare concerns associated with traditional wool and cashmere. Innovations in this area, utilizing materials derived from agricultural waste or specifically engineered plant fibers, will promise to deliver both comfort and sustainability, fitting seamlessly with Stella McCartney's ethos of creating desirable and responsible fashion.

Figure 13. 2035 Stella McCartney *"The Conscious Couture,"* Comfy UI, Tianyi Wang generated.

Prompt: A blonde, curly-haired professional female model wears a minimalist, elegant brown coat made from the fiber of mushrooms, subtle texture, clean lines, a neutral color palette, editorial photo shooting, and soft natural lighting. Standing in front of a softly blurred or abstract background evoking the texture and form of mushrooms in earthy tones. Natural light. With a 35mm lens by a Leica camera.

Figure 13. 2035 Stella McCartney *"The Conscious Couture,"* Comfy UI, Tianyi Wang generated.

Prompt: An attractive black woman wearing a brown mushroom leather jacket and white shorts is standing in the middle and surrounded by gigantic glass mushrooms that have overgrown on her like mycelium. The background is a large installation art gallery. Natural Light. With a 35mm lens by a Leica camera.

Figure 14. 2035 Stella McCartney *"The Conscious Couture,"* Comfy UI, Tianyi Wang generated.

Prompt: A model wears an oversized beige cardigan with textured patterns paired with white trousers and a high-waisted belt for layers. The backdrop is an abstract sculpture of soft fabric waves in shades of pale yellow to ivory, creating a dreamy atmosphere. Her hair has a natural look, adding depth to the scene. With a 35mm lens by a Leica camera.

Figure 15. 2035 Stella McCartney *"The Conscious Couture,"* Comfy UI, Tianyi Wang generated.

Prompt: An oversized cardigan in a woolen knit with intricate detailing and textured patterns inspired by the organic shapes of seashells. The fabric is woven from soft beige threads that shimmer under natural light, creating a surreal effect. An Asian female model stands against a backdrop made entirely of white paper-mâché flowers, adding to the dreamy atmosphere. She wears overflowing linen trousers and ballet slippers, her hair styled loose, adding depth and texture to the scene with a 35mm lens by a Leica camera.

Self-evaluation

Based on my design and practical fashion photography experience, I came up with an imaginative approach for AI to participate in the workflow in the fashion industry from design to production and advertising production stages.

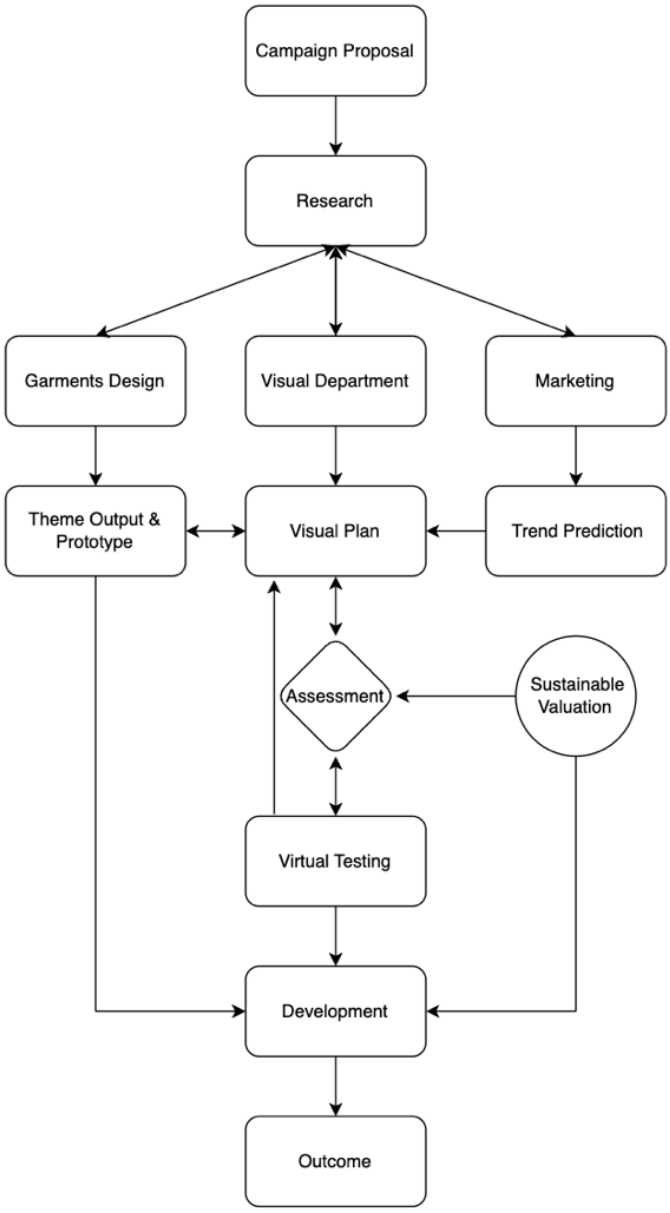


Figure 16 *"AI-Driven Workflow I,"* Tianyi Wang generated.

Designers and photographers started the first round of AI-assistant research after understanding the campaign brief from clients. This basic research would involve marketing trends, target audience, and exploring materials innovations.

Then, this case identified three key parallel clues:

Clothing design: This team refers to creating the campaign's garments.

The visual department: In charge of organizing the visual components of the campaign, including the photography crew group, the art production group, and the post-production group.

Marketing: Collecting and predicting the fashion trends of the present and the future, they offer guidance for other groups.

The fashion design team then moved on to the theme output and prototype stage, where the prototype was made, and the main concept of the apparel line was finalized. The visual section created a visual plan concurrently. Two sources of information were used to inform the plan: trend predictions and preliminary study. To make sure that visual effects were appealing and pertinent, trend prediction entails AI-driven collecting and predicting both present and upcoming fashion trends. After that, the visual plan, possible theme outputs, and prototypes would go through the review stage. The viability and efficacy of the suggested themes and visual effects were assessed in this evaluation. Sustainable assessment would be included in this evaluation, including theme checking and following the requirements of ethical production.

After the evaluation, this campaign would undergo virtual testing. This could involve a virtual try-on of clothing, digital models of visual effects, or other forms of virtual simulation to evaluate audience reactions and identify any potential issues.

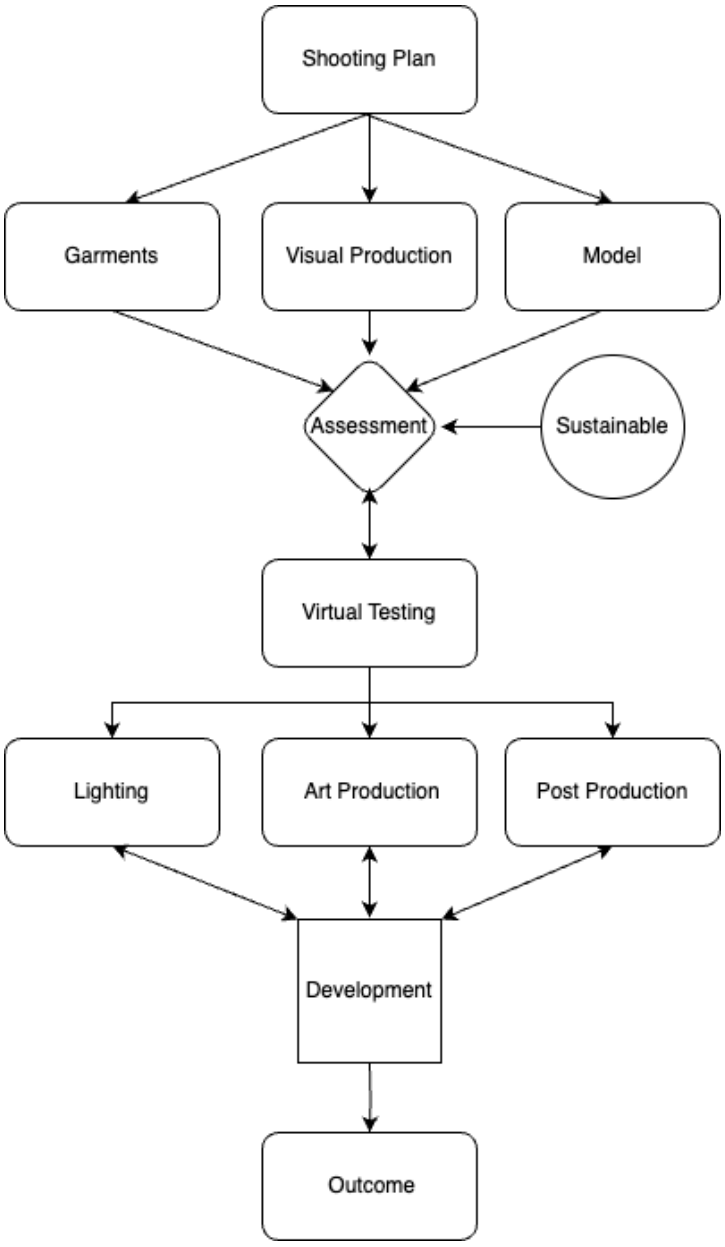


Figure 17. *"AI-Driven Workflow II,"* Tianyi Wang generated.

The results of virtual testing and evaluation would enter the development phase. At this stage, the final campaign development (including clothing, visual effects, and marketing materials) will be refined and ready for release.

The self-assessment of this design practice revealed several key advantages and potential for future development. By envisioning sustainable development principles throughout the entire production cycle of fashion advertising, combined with artificial intelligence tools, from trend prediction in research to virtual prototype design in theme output and prototypes, and minimizing physical samples through virtual testing. The AI-engaged workflow effectively would alleviate environmental issues compared with traditional fashion photography and reduce the production cost of photography practice. The conceptual Stella McCartney 2035 campaign showcases a strong fit with the brand's minimalist elegance and commitment to sustainability by envisioning the use of innovative materials such as Mylo and plant-based wool and visualizing them through AI-generated images. This process explores new visual narratives of sustainable fashion by utilizing the creative potential of ComfyUI and Midjourney. This design not only successfully integrated sustainability into material selection but also into the workflow itself, thereby reducing waste and resource consumption. However, through practice, it was found that the current implementation process is greatly limited by hardware and technological development and could not fully meet the needs of designers. For example, the garments could be modified by different perspectives. The color range should be considered in the production section. These images were generated under the website results, which were coded in SRGB color space. The results were presented as an "Untagged Color Space" in Photoshop. One of my participants pointed out that he was concerned about the capability of different tools on professional software. Although advertisement production costs have been reduced, the hardware cost of deploying AI-driven virtual photography remains high. Moreover, in terms of advertising, the impact of information dissemination on consumers has limitations. Based on the feedback, my audience could be attracted by the visual effects but presented a limited understanding of sustainability. The dissemination of sustainable clothing

consumption concepts requires joint efforts from diverse perspectives. Meanwhile, this practice did not have enough data to collect feedback from visual creators, lacking objective assessment. This workflow has not been approved by a real commercial campaign. This AI generator design outcome still has great potential to showcase more ethical and environmentally friendly fashion communication pathways. However, future iterations may benefit from a deeper analysis of consumer responses to the sustainable fashion visual effects generated by artificial intelligence, as well as the development of more comprehensive and designer-friendly AI visual technologies to optimize sustainable ways that the entire industry can implement.

CONCLUSION

In summary, this study demonstrated that the integration of artificial intelligence into the fashion photography workflow could provide strong support for exploring sustainable fashion campaigns. By integrating AI into the design of a new photography practice workflow and involving AI in the photography production process, this study revealed that AI could assist in the creative exploration and execution of sustainable development concepts. The Stella McCartney 2035 concept event was a concrete example of these advantages, showcasing innovative sustainable materials and aesthetics aligned with the brand achieved through AI. By addressing the gap found in AI and fashion photography, this study provided a novel perspective on how to specifically apply AI to create impactful fashion visual effects based on sustainability principles. While acknowledging the limitations of AI development at the moment, future research can further develop more practical and sustainable artificial intelligence tools.

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FIGURE LIST

APPENDIX I

Garments Image Permission: Zewei Li, *Mobius Band seamless whole-garment woven garment by Zewei Li*

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Name: _____Tianyi Wang_____

email: _____Andrewphoto625@gmail.com_____

Image permission

Mobius Band seamless whole-garment woven garment
by Zewei Li

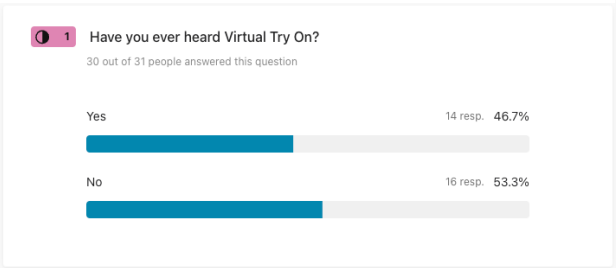
Image RELEASE FORM

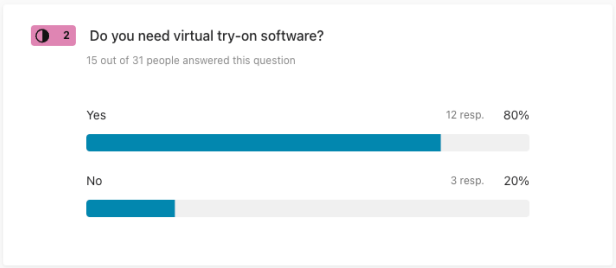
_____ 15/03/2025

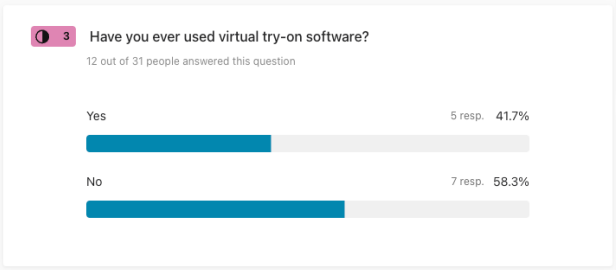
Signature of Fashion designer/researcher Date

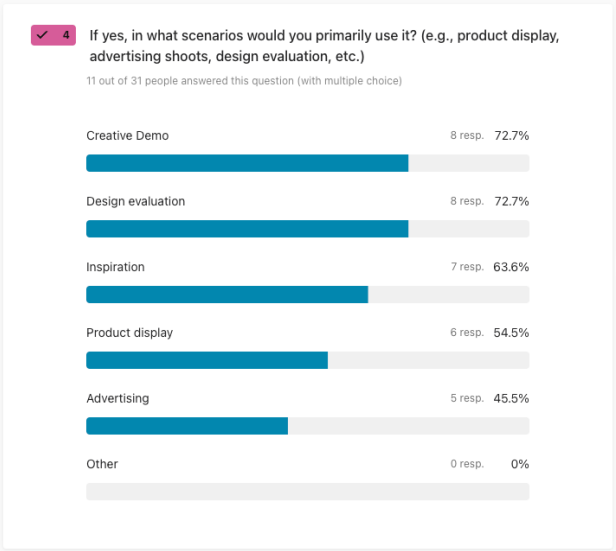
APPENDIX II

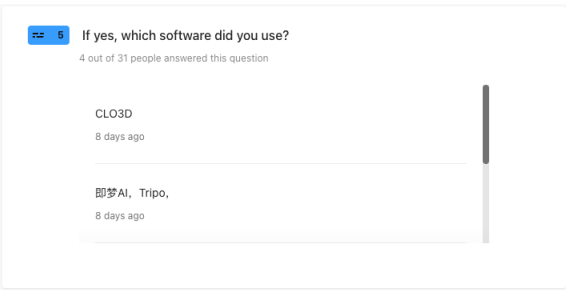
The results of my survey:

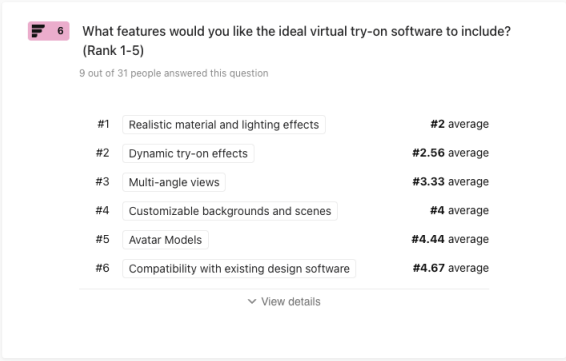


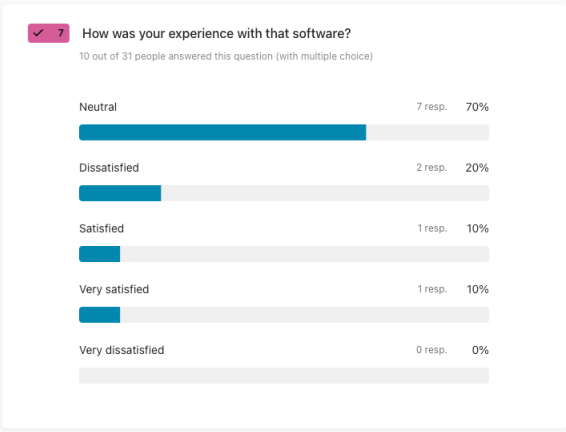


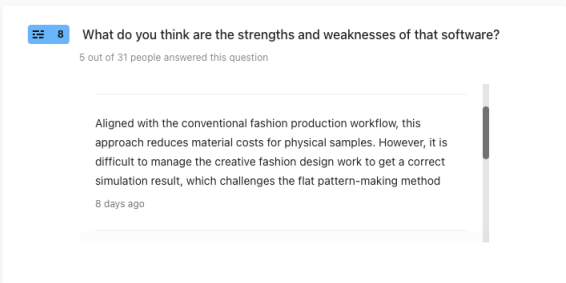






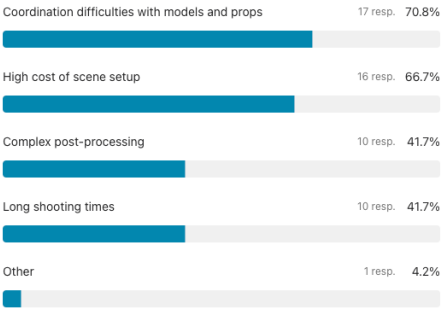






9 What difficulties have you encountered in traditional advertising shoots? (Select all that apply)

24 out of 31 people answered this question (with multiple choice)

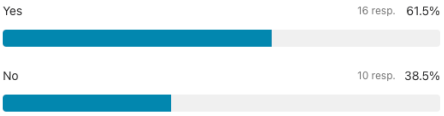


Weather issues

6 months ago

10 Do you think virtual try-on software with AI can solve these problems?

26 out of 31 people answered this question



11 What are your thoughts on AI technology in the fashion industry, specifically around fashion photography and advertising?

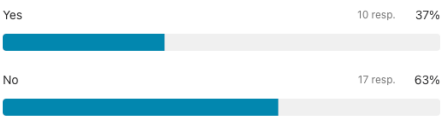
14 out of 31 people answered this question

it can be used during concept design, but since clothes are real fabrics for real people, I think it would be more enviornmental friendly to just go out and try it out.

8 days ago

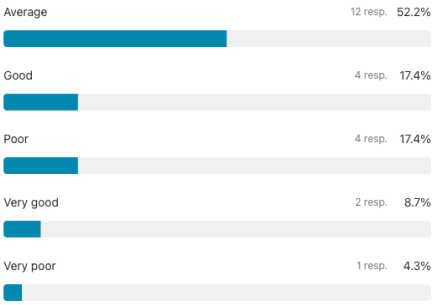
12 Are you aware of existing virtual try-on software in the market?

27 out of 31 people answered this question



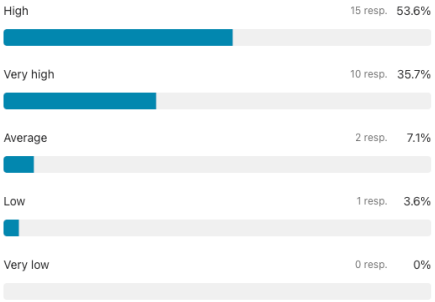
13 How do you think these softwares perform in the market?

23 out of 31 people answered this question



14 How do you think the market demand for virtual try-on software will be in the future?

28 out of 31 people answered this question



15 Do you think virtual try-on software can help reduce the environmental impact of advertising shoots?

29 out of 31 people answered this question

16 What kind of user experience do you think would most enhance your work efficiency?

19 out of 31 people answered this question

Sketching with reference images, verbal text communication. I think both are good, but I actually prefer text communication because it can be archived, and then all requirements can be put forward at once, rather than adding frequently.

8 days ago

16 What kind of user experience do you think would most enhance your work efficiency?

19 out of 31 people answered this question

Sketching with reference images, verbal text communication. I think both are good, but I actually prefer text communication because it can be archived, and then all requirements can be put forward at once, rather than adding frequently.

8 days ago

17 What concerns or worries do you have about AI entering the fashion advertising field? (e.g., uniqueness of creativity, reliability of technology, privacy issues, etc.)

22 out of 31 people answered this question

fabric, color and textures, lightings and fitting conditions with body differs from reality

8 days ago

It's actually a personal information leak.

8 days ago

18 What innovations and improvements do you think virtual try-on software can have in the future?

21 out of 31 people answered this question

generation speed, sense of realism

8 days ago

sell infomations to games/charactor design company

8 days ago

19 How much cost do you think virtual try-on software can save for your business? (e.g., scene setup, model fees, shooting time, etc.)

18 out of 31 people answered this question

10-20 minutes if client is open to see inspirations.

7 days ago

A lot

8 days ago