MODAL EVENTS AND A.I. FASHION
MATHEMATICS AND ARTIFICIAL INTELLIGENCE BETWEEN PRESENT AND FUTURE

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Abstract

The contribution brings together some initial reflections of an ongoing research on the relationship between fashion and artificial intelligence. Within the theoretical framework of posthuman fashion, some international case studies, which represent the first experiments of introducing A.I. in fashion design, will be analysed. From here, reflection will involve the role of numbers, big data and static probability in this dynamic field of research and innovation. The aim of this contribution is to question the current and future role of fashion designers and how the fashion system could change through human-machine collaboration.

Introduction

In recent months, artificial intelligence has been introducing itself vigorously and very rapidly into various design disciplines, and fashion represents an area of strong experimentation. The development of A.I. software and platforms, in many cases open source, allows anyone to explore possible collaborations between humans and artificial intelligence, even without programming and computer code writing skills. Therefore, it seems urgent to question the future prospects and expectations of the role of artificial intelligence in fashion's creative, production, communication, and distribution processes, with its consequences on the professional skills required and those that may become redundant. The contribution brings together the initial reflections of a research path that aims to observe and investigate these phenomena, hypothesizing possible changes in fashion design in the role of designers with the development of A.I.

The purpose of this essay is to outline a picture of the current reality, investigating early experiences of the use of artificial intelligence in fashion; evaluating perspectives related to design and designers; and developing a reflection in mathematical terms on the potential of this tool and the synergy between creative and machine.

A.I. in the Posthuman Fashion Perspective

It is first necessary to clarify what is meant by artificial intelligence: the possibility of establishing through machines, technologies and software connections between various pieces of information that are immediately related in a manner similar to that of human intelligence. The scientific literature related to the applications of artificial intelligence in the fashion system is still at an early stage, going mainly to investigate its use in marketing strategies through the analysis of big data (Barile & Sugiyama, 2020; Silva et al., 2020). More developed, on the other hand, is the theoretical reflection on the relations between human and technology in fashion, particularly through contributions developed from philosophical theories on posthuman (Braidotti, 2013) and cyborg (Haraway, 2016).

Related to the topic on the Anthropocene, Anneke Smelik, professor of "Visual Culture" at the Dutch

University of Radboud Nijmegen. In a lecture given at the Iuav University of Venice in March 2022, she emphasized how human activity has radically changed the planet; and questioned what it means to live in the age of humanity. In Smelik's posthuman perspective, the nonhuman is also included; in fact, his lecture focused on ontological questions related to human beings and their responsibility to the planet, humans themselves, animals and plants. Smelik introduced the concept of New Materialism (2018) by highlighting what may be new directions for studies in the field of fashion. In doing so, non-human factors are highlighted in the field and in research that is dropped into a posthuman context, where we insist on the study of the most standard raw materials such as cotton, all the way to smart materials such as the "solar film" proposed by MIT.

Within this framework are the first experiments in the application of A.I. in the fashion system, which initially involved sales processes and concerned companies such as Yoox and Amazon. In 2017, during a workshop on machine learning and fashion, Amazon said that a group of researchers at the company is studying the prospect of collecting images of a certain fashion style and then, through an algorithm, reproducing similar but new patterns based on those images (Knight, 2017). The specific algorithm is called GAN (Generative Adversarial Network), a subset of artificial intelligence used in machine learning. The GAN technique generates photographs that are synthetic but look authentic to the naked eye. "There's been a lot of movement in this by companies like Amazon trying to understand how fashion is developing in the world," Kavita Bala professor in computer science at Cornell University told the MIT Technology Review conference. Another example is the YooxMirror project presented in December 2018 by Italian online retail company Yoox Net-A-Porter (YNAP).[1] This application, supported by artificial intelligence, is designed as a virtual fitting room that offers users an interactive experience in which they can virtually match and wear clothes and accessories, share them on social networks, and eventually purchase them (Vaccari & Franzo, 2022; Giano, 2019). A further example of the early experiments of artificial intelligence in fashion is the case of

influencer Miquela Sousa aka "Lil Miquela" a California model and singer influencer, star of emblematic fashion campaigns along with Millie Bobby Brown and Bella Hadid. Lil Miquela is an image, she does not exist in physical reality, yet she has a rather relevant incidence in the social world and by corollary in the fashion world (Pantano, 2018). The profile is channeled on fashion and lifestyle and is in the hands of the U.S.-based Brud Company, which took the project to Milan Fashion Week 2018 in collaboration with Prada.

These early examples of the introduction of A.I. into communication and sales processes underscore how it is a clear asset from the perspective of the seller in direct relationship with the consumer, limited, however, in the last segments of the supply chain. Significant, however, are the current implications and possible evolutions of the spread of A.I. in various areas of the fashion system (Beckwith, 2019; Catricalà & Maccallini, 2021). A study, conducted by a team at Princeton University, investigated with respect to the changes that will occur in the occupations and jobs most at risk. It found that due in part to development in the field of robotics, the entire assembly-related sector could be converted, as well as for job profiles related to photography, press officers and trend researchers. In other areas, too, there are clear signs of a rapid change in occupations and skills in the coming years. One example is the statement by Arvind Krishna, CEO of IBM, who in an interview with Bloomberg in May 2023 outlined the company's near future: in the next five years, 30 percent of back-office roles will be replaced with artificial intelligence going on to replace about seven thousand eight hundred workers and consequent salaries (Ford, 2023). On such a recent and little-analyzed phenomenon, opinions are divided over the complete use of A.I. However, one example that can be considered virtuous is the child of the joint venture between Mermec Engineering and Temera, where the intent becomes to rely on artificial intelligence to recover warehouse inventories and go on to conceive an entirely new product. Of particular note is the use of the multi-modal identification system, which involves the use of Rfid (radio frequency identification) technologies, guaranteeing the recognition and therefore the material definition of any object taken into consideration. This type of artificial intelligence is called "weak A.I." and has been the most widely used for more than twenty years, although consumers are not fully aware of it as it is often confused with "strong A.I." or A.S.I.

(Artificial Super Intelligence) in its most basic form would be able to act exactly like a human being: making programs, solving problems and learning. At its most basic it would far exceed the intelligence of the human brain. However, its use is still in the experimental stage and does not find any real resonance or practical uses.

This paper, however, intends to focus the analysis from human-machine collaboration in the fashion design stages. Adding artificial intelligence to current production chains and creative processes would mean providing the creative person with tools that can help him or her, for example, in managing collections, deciphering trends, cataloging work, and minimizing material waste. Through a desk analysis, some cases of A.I. use in the fashion design stages were evaluated, looking at how it collaborates with or replaces the fashion designer.

Fashion Designers and Artificial Creativity

Nike has decided to exploit, starting in 2019, predictive possibilities by relying on artificial intelligence by acquiring Celect, a company that operates in the field of predictive technologies in retail shopping and analysis of shopping habits (Pitozzi, 2019). This perspective marks a clear direction relative to the designer's work. In addition, this process saves the consumer time and money, logistically cutting down the problem of inventory in the warehouse and thus of space and energy consumption, and giving the designer the freedom about the project with respect to new collections coming out, not having to take into account the limitations given by sales but taking advantage of the predictions provided by A.I. to more easily define a line-up and inventory.

The intermingling of fashion and artificial intelligence seems to have entered by right among the tools designers use to think and produce their designs albeit with sporadic case histories. From the development of a theme, which agrees with the indications arising from trend research, to image research, to the design of a collection, pattern making, fabric consumption, and so on, A.I. would potentially have the opportunity to enter, as a designer-friendly tool, and not as a replacement, into each of these chains. Since 2005, the Dutch designer Anouk Wipprecht, making use of "Arduino," a hardware platform conceived and developed by members of the Interaction Design Institute in Ivrea, has begun to work synergistically with I.A., creating a meaningful relationship between fashion robotics and design. Starting from the use of robotic-computer tools, the designer, insists on the theme of "wellbeing," indirectly declaring her desire to use A.I. as a resource to design and produce fashion objects at the service of the human being, bringing him back to a more genuine, primordial relationship towards clothing; something that allows, not only to cover oneself, but also able to measure bio-medical data or regulate sweating. Another of the noteworthy cases is that of Levi's, which has stated that it wants to pair its models, in the flesh, with models generated with artificial intelligence, an idea by the way already perpetuated back in 2006 by Alexander McQueen when he decided to bring the hologram of model Kate Moss to the runway. Another virtuous example is that of The Fabricant. Amber Stoolen, the brand's co-founder, recently unveiled "The Fabricant Studio": a real creative space in digital format where users have the opportunity to create a wardrobe in the metaverse. According to the developers, the platform was created to allow anyone to identify with a digital fashion designer, and its implementation could provide significant help to the designers themselves (Crook, 2021).

We could then begin to get used to the marriage between A.I. and the creative, in that the creative himself would have at his disposal a "weapon" that he could make use of. A tool capable of speeding up some aspects of creativity, such as the availability of materials on which to base research, in order to give the right breathing space to others, such as the choice of a meaning and therefore of a meaning, of a message, to be conferred on the designer's work, a change of course that is set to guide the fashion industry toward a new reality made up of priorities, downsizing the rhythms of production and elaboration of ideas that fashion has adopted for several years.

The spread of A.I. in fashion led to the first Fashion Week entirely dedicated to this theme[2]. In April 2023, the latest innovations in the computer-technological world in relation to fashion were presented, outlining a new image and avant-garde imagery. The main objective of this event is to bring out what the possibilities of the IT sector are in

2 https://fashionweek.ai/

relation to the fashion world in an attempt to secure a new perspective for the industry. This initiative is credited with encouraging more than 350 designers to step into the spotlight and showcase creations that would otherwise never have been made or would not have enjoyed the visibility of the event, held in New York at the Spring Studio. This allows new designers to experiment with AI-based generative technologies while lowering material consumption. For the designers, pushed into a new kind of experimentation, in this event, they are motivated by the great visibility offered by the event and the opportunity to produce their garments materially, thanks to the collaboration with e-tailer Revolve Group, once they are awarded. There are about ninety garments produced, but during the event it was possible to see about a hundred times more, however, the message of A.I. Fashion Week is of value since, in its desire to offer a virtual fashion show, it does not lose its contact with reality and its more material aspects.

A.I. and its Usability

Those who work with Artificial Intelligence, particularly developers, generally are familiar with the mathematical world more specifically with algorithms, which are applied to empower A.I. to solve problems and have decision-making capabilities. The mathematical study within this reality also extends to principal component analysis (PCA) and singular value decomposition (SVD), which are used to optimize and decrease the volume of data in order to improve the performance of artificial intelligence systems by making them smoother. The study of statistics and probability makes it possible to make clearer reading of data, giving the ability to make predictions even on uncertain or incomplete models. The 'use of Beyes' theorem for example, is used to trace the causes of an event that has already occurred; this allows scholars to intersect different sources in order to be able to reshape the inputs that artificial intelligence uses in its processing and thus in its work. Mathematics, the foundation of artificial intelligence, provides the tools to design and update sophisticated algorithms that enable machines to emulate human intelligence.
Below the paper introduces a reflection on statistics with the aim of raising questions about the relationship between artificial intelligence and fashion, an interpenetration between numerical

issues and qualitative approaches, between hard science and soft science. A.I. raises a number of issues, such as the opacity of decision-making and discrimination. Skepticism toward artificial intelligence comes very close to the definition in the mathematical world of a paradox i.e., the description of a fact that contradicts common opinion or everyday experience, thus succeeding in being surprising, extraordinary or bizarre and thus in some cases capable of generating distrust. First point, essential to the research, is to define its object itself. From the empirical point of view, fashion is a set of what are referred to in mathematical circles as Events, that is, the set of results to which a degree of consistency, defined by an objective reality, is assigned or noted, unambiguous and well-defined. To make the concept clearer, we could define the future of an event as the print creation (event 1), on a certain type of fabric (event 2), dedicated to a dress (event 3), which will be mass produced (event 4) and sold in a certain country (event 5). A physical-mathematical concept of timelessness must be integrated with the proposed incipit; Time is a universally agreed perception as a mode of succession of events and the relationship between them. This implies that events in the physical world are determined by the structures determined by the observer as demonstrated by Albert Einstein with the discovery of "General Relativity". Relative to the analysis conducted, the concept of time is untethered from the demonstration since no factors determined by "delta t" result in combinatorial and statistical calculus. This element corroborates, albeit in a theoretical way, the concept of relativity related to a system. The fashion world does not consider the canonical annual time period, but instead relies on expedients related to seasonality, punctuated by the publication of magazines, the release of collections, articles, photographs, collaborations, and so on. In short, we consider time in fashion to be a character inextricably linked to the historical period but capable of dilating (referring instead to the canonical system of dividing time (hours, days, months, years, decades, centuries).
Having defined the concept of the timelessness of fashion, in statistical terms, we can reason about the definition of fashion as an event or rather the union of several events combined with each other. Cataloging and defining these events is possible, however, a preliminary analysis must be carried out, where the parameters of evaluation are defined. These parameters may relate to matter, place or even time, for just as it is true that time is relative,

it is equally true as emphasized and demonstrated by Lorentz and Minkowski that space and time as independent systems do not subsist, but fall within the realm of physics, the experimental one, and it is the union of the two that preserves independent reality. There is already a definition of fashion in the mathematical world: fashion corresponds to the modal value, the value that occurs with greater frequency and admits more useful outcomes. The graph representing fashion is constructed by the intersection of the y-axis, where the frequency is indicated, that is, how many times a given event occurs, and the x-axis, the "mode," that is, what type of event. Events as we pointed out earlier can include any element valid to statistical evaluation and analysis of the graph. What is ascribable graphically falls under the domain of statistics. From statistics, i.e., the evaluation of events that have already occurred, one moves to probability, i.e., the combination of events that have yet to occur.

This falls under the realm of probability, it is clear that trendforecasting companies such as WGSN (World's Global Style Network) promote a research practice where the presence of data is of strong relevance, but it is also true that, given the scope of the research, data analysis and predictions based on combinatorial calculus alone are not perpetuated, but the reading is entrusted to humanistic subjects such as anthropology or psychology (Dall'Aglio, 2003). In this way, they are able to provide detailed reports to thousands of fashion companies by analyzing macro and micro trends, which have strategic importance for the choices of designers and entrepreneurs, especially in international circles.

The case I would like to theorize finds several points of contact with a mathematical paradox.

It should first be clarified that a mathematical paradox is different from antinomy, that is, a logical contradiction, but instead a result that is different from that which is related to man's natural intuition. In this particular case, it is pointed out that the possibility that in a group of people at least two will have their birthdays on the same day (the fashion of that group), is much higher than one might guess. The days to be considered are 365, the same probability of birth is given to each day. This data suggests that to have a 50 percent chance we would need half as many people as days. This is not the case. To have a 50.7% chance, 23 people are sufficient; with 50 people we get to 97%. The most effective method to calculate this possibility is to calculate the nonpossibility. That is, we calculate the

complementary of the number we are looking for. This means that the fashion in a sense is predictable on a large scale, the more we go into detail the more the events increase, it is as if we increase the days to consider, no longer 365 but for example a hundred times as many, but it is also true that we would have more elements to take into account, that is, the people we consider in our sampling frame.

Conclusions

In order to make the most of artificial intelligence, it is necessary to create the right culture around the phenomenon, avoiding the problems that impede the progress of research in this regard; it means creating a working culture that fully supports the A.I. ecosystem. In addition, there is an urgent need to raise public awareness of the use and 'integration of A.I. into mass culture. From what emerged in the previous paragraph, this reality still seems to be perceived not as a favorable tool but as disruptive to daily experience or even controlling. By permeating into the all-round population, A.I. can be the tool that can bring out new designers, new artists, to further democratize creative processes.

The conclusion of this reflection is one related to the possibility of archiving; fashion uses very rarefied parameters, not precise units. This complicates the possibility of data collection and its subsequent reworking by the designer. Should the process of data collection be totally digitized, we would have the possibility of calculating, first on a large scale and then in the specifics of the individual garment whether something will be trendy or not, reasoning about the likelihood of this event happening, and furthermore we would be able to use these tools as an additional resource available to the creative. The stages of writing, photographic research, and drawing would be enriched by a new tool that would provide a greater mapping of the instances and inputs that the designer uses to design, also improving the possible "gestation" and elaboration period of the project.

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