

Decoding Fashion Evolution:

A Systematic Review of Fashion research using computational approaches

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Background: The fashion industry is undergoing an evolution where digital technologies, especially artificial intelligence (AI), are revolutionizing the way the entire industry works. (Luce, 2019) Digital technology has played an essential role in enhancing the supply chain to elevate the customer experience. (Gunasekaran, 2001) The swift advancement of the information technology (IT) sector has resulted in a lag in the traditional peer-reviewed publishing process, thereby prompting IT experts and scholars to prefer presenting their research papers at conferences. This shift in scholarly dissemination practices brings inconvenience to fashion researchers. Moreover, researchers in fashion have not explored the potential of these computational approaches extensively, primarily due to a lack of training or resources. (Zhao, 2022) It creates an opportunity for a new interdisciplinary field to emerge, bridging the gap between computer science, fashion, textile, and apparel research. Therefore, this paper aims to provide a multidisciplinary framework for digital technological applications in the fashion industry, emphasizing computational approaches. By compiling and organizing relevant journal articles and conference proceedings from 2020 to 2023, we hope to enable researchers in the fashion fields to access better and understand the potential of these innovations.

This research adopted the framework for the domain of clothing and textiles in the global supply chain proposed by Ha-Brookshire and Hawley (2013), outlining key activities throughout the fashion supply chain ranging from design/product development to consumer behavior. Based on this framework, we raised two research questions 1) what is the potential of computational approaches in addressing research questions related to various supply chain functions in the fashion industry, and 2) what is the emerging trend of employing computational techniques in fashion research?

Methodology: To achieve research goals, we employed a systematic review approach using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methods developed by Moher et al. (2009). The PRISMA approach comprises four stages: identification, screening, eligibility, and inclusion. We primarily relied on the well-known

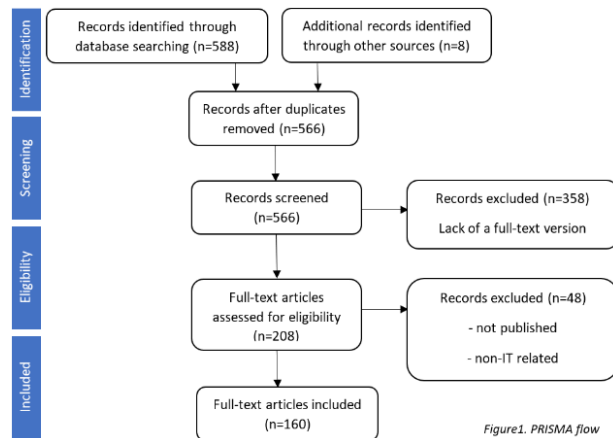


Figure 1. PRISMA flow

computer science bibliographic database DBLP to identify relevant fashion, textile, and apparel publications. DBLP tracks all important journals and conference proceedings on computer science. Using keywords including "fashion," "textile," and "apparel," we identified 588 publications published between 2020 and March 2023. Through the PRISMA process shown in Figure 1, we excluded the articles that are a) irrelevant to the fashion industry, b) lack a full-text version, c) not published, d) non-IT related, and eventually included 168 articles for detailed analysis. Although we recognize that our study may not be exhaustive, it provides a reasonably comprehensive overview of the current achievements, trends, challenges, and tasks in fashion research using computational techniques.

Findings: First, to answer the RQ1 with valuable interdisciplinary insights, we adopted two taxonomy methods to organize the bibliographies: one was proposed by Cheng et al. (2022) in terms of computational techniques, which includes Detection,

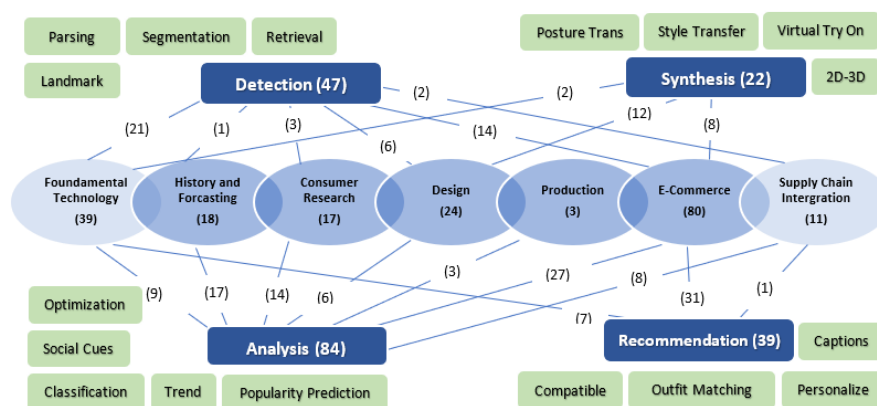


Figure2. A map of IT related research in the fashion industry from 2020 to Mar. 2023.

Analysis, Synthesis, and Recommendation; another was according to supply chain functional sections presented by Ha Brookshire (2013), divided into History and forecasting, Consumer research, Design, Production, E-commerce, which combines merchandising and retail functions. Besides these exciting sections in the fashion supply chain, we suggested two additional categories: Fundamental technologies and Supply chain integration, to collect relevant supporting articles. This study established an interdisciplinary framework to organize the relevant studies. We analyzed the research relationship in these two domains and drew a map, as shown in Figure 2. Detection (n=47) is one of the fundamental tasks of AI, subcategories such as clothes landmark detection, parsing, and image retrieval are used in any supply chain functions. Analysis (n=84) is another essential data-driven toolbox, including various means for different goals, such as classification, optimization, trend prediction, and so on, linking to all the supply chain functions. Synthesis (n=22) emphasizes developing new images, so it has been primarily utilized in design and E-commerce; the studies include transferring style or posture, virtual try-on, and 3D

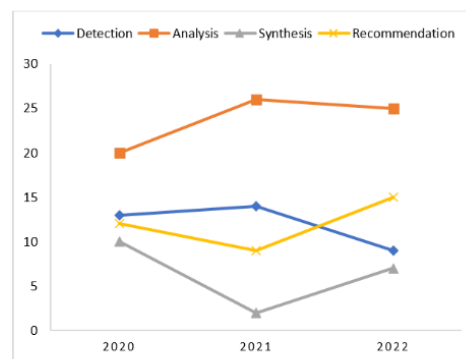


Figure3. Article distribution by year

modeling. Recommendation (n=39) is specifically for E-commerce.

Second, to answer RQ2, we summarized the articles from 2020 to 2022; the distribution shows that in the recent year, while the studies of detection decreased and analysis kept steady, the studies regarding analysis and recommendation are increasing. Analyzing articles in terms of supply chain functions, we identified articles for History and Forecasting (n=18), Consumer research (n=17), Design (n=24), Production (n=3), E-commerce (n=80), the articles are likely to concentrate on E-commerce, especially on recommendation means. The latest trends include developing recommendation algorithms using deep learning by combining text and images, 2d to 3d conversion simulations, etc. Probably due to the lag of B2B relative to B2C, most researchers have used consumption data for studies, and research based on industrial data is still limited. This field requires further development.

Conclusion: As the fashion industry continues to evolve, researchers need to explore the potential of computational techniques for various research opportunities in fashion. The findings in this paper can serve as a starting point for researchers and professionals in the fashion industry to access better and understand the potential of digital technology innovations, opening new avenues for interdisciplinary research and collaboration.

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