



Fashion and Data Mining

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Commentary

The size of the global fashion industry is about 300 billion dollars in 2020 and is expected to continue to grow [1]. Fashion not only reflects the creativity but also has implications on our daily lives and the economics. The advance in information technology, proliferation of a wide variety of data and the availability of different methods have provided new opportunities for academics and practitioners or startups. This commentary will briefly summarize prior studies focusing on the fashion contexts by using different data mining techniques. Towards the end, we highlight six possible future research directions with the hope to encourage more studies in this area.

The advance in information technology such as social media has accelerated how it may affect our daily lives and has created more challenges at the same time. For example, with the development of social media, it now allows individuals to personalize their fashion styles [2]. However, given the amount of information posted on social media, it accelerates the turnover of topics and makes it even harder to be noticed [3]. Hsiao, et al. [3] demonstrate that the presence of large national brands has a positive spillover effect on the popularity of private labels on fashion social media.

The development in information technology has also changed the availability of data and how fast the information is created. For example, there are about 1 billion Instagram users in 2021 [4] posting images continuously and more than 500 hours of videos are uploaded to YouTube every minute [5]. The rich data now goes beyond the physical store shopping activities. It now includes textual information, images, videos, locations, and more importantly all the interactions and all kinds of heterogeneous network information. For instance, several studies such as Lin and Wang [6] Kurup [7] (2017), Singh, et al. [8], Shravan Kumar SS,

et al. [9], Yusan L, et al. [10], Lin Y, et al. [11], and Chen et al. [12] have used the fashion data to discuss the fashion recommendation, branding prediction and even the next season trends. Given the importance of the influencers, Yusan L, et al. [13] have investigated the hidden influencer's network.

More importantly, we now have more advanced techniques to make sense of the rich datasets. For example, we can now apply more advanced analytics techniques, such as natural language processing, deep learning, or artificial intelligence to address fashion-related decisions such as searching for similar products [14], understand users' inputted addresses [15] or understand sustainable fashion and users' shopping behavior [16].

Given the discussion above, we would like to highlight six potential research directions that can further contribute to the field:

The Use of Mixed Methods

The richness of data and the advance in techniques have provided more insights that can help practitioners and academics capture the dynamics in the fashion industry. However, many of the decisions are related to the subjective preferences or judgments of the users or customers, such as the branding preferences, visual aesthetic, the decision on the combination of accessories, etc. In addition, given the rapidly changing nature of the industry, the recommendations, and the extracted features, for example, also need to be evaluated by the customers. Accordingly, in addition to the more frequent review of the models, it is inevitable to involve end-users to verify the developed models or consider additional information that is not currently captured or probably not available for future research. We would encourage the use of mixed methods approach to either drive the direction of the

analysis or to supplement additional insights. This also encourages the collaboration between researchers from different fields and the collaboration between practitioners and academics so we can address the challenges faced by the industry and demonstrate the value of adopting more advanced technical methods for decision making.

Meanings of Images or Video Clips

Images or video clips convey lots of information. High-quality and high-resolution images or video clips are also needed to reflect the work in the fashion industry. However, it is still quite limited in how we can use more advanced techniques to extract how people view the images or videos and interpret them. By doing so, we will be able to somehow gauge the impact of using all the visual cues with the textual information and to examine how the use of different visual information may change users' reactions. This can be helpful for individual users to evaluate the impact of the images or videos they post and can be beneficial for companies to investigate the performance of the marketing campaigns or perception of fashion shows, for instance. It can also be investigated how these pieces of perceived information may be used to strengthen the branding effect. This exploration also goes back to the first point that mixed methods can be effective when evaluating and implementing related techniques.

Attention or Conversion or Both and User Interactions

The fashion industry is increasing its digital presence. What do these fashion brands, no matter they are national brands or private brands, compete for, especially on social media? Do they compete for attention and followers to increase advertising revenues or do they compete from attention to actual behavior? More studies about how we can better capture or predict attention are needed. More studies are also required about cross-channel (e.g., physical outlets versus virtual outlets) competition or cross sub-brand competition even within the same company. This is especially challenging when we are facing a multi-media, multi-source environment so the information that has to be processed can be from textual to image/video and is updated constantly. This is especially challenging when nowadays users have a lot of chances to interact with each other through various channels. The interactions and the hidden network of users can play a major role when affecting the attention and the conversion process.

Brand and Product Associations and the Prediction of Switching

Through data mining, the fashion industry could also benefit to derive the brand and production association. For example, when a user comments on a brand/product, it is very likely that this user also compares this brand/product with alternative ones. Alternative ones could be similar products from the same brand or similar products from the competing brands. Understanding the

brand and product associations is essential in the fashion industry because it could help firm strategically allocate their resources to maintain their competitive advantages. More importantly, through longitudinal social media data, the firms could also understand how brand and product associations change over time and even predict switching associations. Although some prior research in the fashion industry setting [3] (e.g., Hsiao et al. 2020) has recognized the importance of brand associations, we witness relatively few studies to derive associations, particularly in the product level and develop the prediction models for switching associations.

Global Supply Chain

This has become a critical issue in the past several years with all the debates of different materials and of course the pandemic. Studies have addressed the optimization of sourcing and routing for the fashion industry. However, with the uncertainties caused by the pandemic, McKinsey [17], for instance, demonstrates the change in buying behavior. The same study also shows the challenges for inventory allocation and management. Given all the changing demand and buying behaviors adding to the changing preferences and trends, it is necessary for academics and practitioners to work together to develop different dynamic models that can be flexible enough to accommodate the changes in different parameters to increase the resiliency of companies.

Copyright and Privacy Issues

It has been a debate about whether fashion design should be copyrighted. The debate started from whether the fashion week design ideas should be implemented without any restriction by fast fashion brands. The copyright issue is not just about the fashion design from fashion weeks. Digital media copyright has always been an issue. The inappropriate use of digital materials can bring major challenges for companies to protect their copyrighted materials and their brand's reputation. Regardless of the perspectives from regulations, this involves whether the platform that contains all these materials can quickly identify potential similarities with a high accuracy rate and how we can automate the processing of all the information flowing in the market. Nevertheless, this is always challenging as the platform is now filtering information on the Internet and may deter all the innovation and interactions. It is also always an ethical issue regarding whether organizations, researchers, or data brokers can collect even public information and make inference after integrating different pieces of information together, which may change the industry's reliance on new technology and new techniques.

The fashion industry provides a great context to adopt more advanced data mining techniques to support a wide range of business decisions. This commentary provides a brief summary of recent studies and highlights six possible future research directions to encourage more studies in this area so we can create more solutions for professionals and startups and to advance our knowledge in this field.

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Conflict of Interest

Author declares no conflict of interest.

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