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From Runway to Recommendation: Big Data's Impact on Fashion E-Commerce

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ABSTRACT :

The fashion e-commerce landscape is evolving rapidly, driven by the power of big data analytics. This paper explores how Avenue Fashion, a prominent fashion e- commerce website, has integrated big data technologies to enhance personalization, improve recommendation systems, forecast fashion trends, and streamline supply chain management. By analyzing structured and unstructured data from consumer interactions, social media, and market trends, Avenue Fashion has built a responsive and customer-centric platform. This study presents the company's strategies, technological applications, ethical considerations, and the broader implications for fashion e-commerce. It contributes to the growing literature on data-driven digital transformation in the retail sector.

Introduction

With the rise of digital commerce, the fashion industry is undergoing a significant transformation. Consumers now expect highly personalized, seamless, and engaging shopping experiences online. Avenue Fashion, an innovative e- commerce brand, leverages big data analytics to meet these expectations and differentiate itself in a competitive market. Big data enables the platform to understand consumer behavior in real time, optimize operations, and deliver tailored recommendations, bridging the gap between fashion runways and online retail.[1][2]

Big data analytics enables organizations to process massive volumes of real-time and historical data to uncover patterns, predict outcomes, and optimize operations [7]. Within e-commerce, this translates into capabilities such as real-time personalization, targeted marketing, dynamic pricing, and trend forecasting—all of which are instrumental in enhancing the online shopping experience [3].

This paper investigates the application of big data in Avenue Fashion's e-commerce platform, analyzing how data is used to personalize shopping experiences, predict style trends, optimize inventory, and enhance customer satisfaction. By reviewing scholarly literature and Avenue Fashion's strategies, this study offers insights into the role of data in shaping the future of fashion retail.

Literature Review

The use of big data in the fashion e- commerce industry has gained substantial scholarly attention due to its transformative impact on personalization, operational efficiency, and trend prediction. In retail environments, big data allows for enhanced customer experiences through the analysis of purchase histories, behavioral trends, and social interactions [1]. Chaudhuri et al. [1] emphasized that data-driven decision- making in retail contributes significantly to customer retention and competitive advantage. Similarly, Ngai et al. [2] underlined how operational and IT capabilities shape supply chain agility, especially in dynamic sectors like fashion.

Bhardwaj and Fairhurst [4] introduced the fast fashion model, which thrives on short lead times and rapidly changing consumer preferences. Big data plays a critical role here by enabling companies like Avenue Fashion to adapt to consumer feedback in near real-time. Turker and Altuntas [6] explored sustainable supply chain practices in fast fashion, where big data is employed to optimize inventory and reduce waste.

On the technology front, recommender systems have advanced from traditional collaborative filtering to hybrid and deep learning approaches, facilitating more personalized user experiences. Jannach et al. [3] and Zhang et al. [7] explored these systems' evolution, showcasing their significance in e-commerce personalization. Avenue Fashion integrates such advanced recommender systems, which account for customer preferences, click patterns, and demographic data.

Social media analytics has become another vital source of fashion trend forecasting. Phan et al. [5] described how consumer behavior on platforms like Instagram and Pinterest influences fashion retailers' inventory and marketing strategies. Avenue Fashion utilizes these insights through machine learning-based sentiment analysis and computer vision to align its offerings with emerging trends.

Collectively, this literature establishes a strong foundation for analyzing how Avenue Fashion leverages big data to enhance its e-commerce platform. It underscores the interdisciplinary nature of big data, encompassing fields like computer science, behavioral economics, and supply chain management.

Methodology

This study employs a case-based qualitative methodology, combining academic research with an analysis of Avenue Fashion's publicly available data practices, website features, and marketing strategies. Industry reports, customer feedback, and performance metrics were examined to evaluate how Avenue Fashion utilizes big data.

Literature was selected based on relevance to e-commerce, fashion, and data analytics to ensure a robust framework for analysis. Key metrics considered include website engagement statistics, conversion rates, customer retention, inventory turnover, and trend alignment success rates. Tools and technologies such as Hadoop, Apache Spark, TensorFlow, and custom machine learning pipelines were identified as part of Avenue Fashion's technology stack.[1]

The research emphasizes triangulation to ensure validity, using multiple data points to analyze the correlation between Avenue Fashion's strategies and industry best practices.[2]

Application of Big Data in Avenue Fashion

Personalized Recommendations Avenue Fashion's recommender engine integrates browsing data, purchase history, and customer profiles to suggest fashion items tailored to individual preferences. Utilizing hybrid models combining collaborative filtering and content-based filtering, the platform ensures high recommendation accuracy [3][7]

Trend Forecasting The company leverages data from social platforms, search engines, and fashion blogs to identify and forecast emerging trends. Realtime sentiment analysis and visual recognition tools allow Avenue Fashion to adjust collections proactively [5]

Inventory and Supply Chain Optimization Avenue Fashion uses predictive analytics to anticipate product demand, minimize overstocking, and streamline logistics. It ensures responsive supply chain operations.[4][6]

Customer Segmentation and Targeting By analyzing user interactions, demographics, and purchasing behavior, Avenue Fashion segments its customers for

personalized marketing. These targeted campaigns increase engagement and loyalty[2]

Real-Time Personalization and Dynamic Pricing By integrating big data into its front-end architecture, Avenue Fashion delivers real-time product recommendations, dynamic pricing, and location-specific offers. A/B testing frameworks continuously optimize UI/UX, while AI-driven dynamic pricing adjusts based on user behavior, time of day, and competitor pricing.[1]

Discussion

The discussion reveals that Avenue Fashion's data integration across departments created synergies that aligned business intelligence with creative direction. For example, designers now consult real-time dashboards reflecting current fashion sentiment before finalizing collections [5].

However, while Avenue Fashion benefits from automation and data-driven decisions, its reliance on third-party APIs (e.g., Google Trends, Instagram Graph API) presents scalability and reliability issues.

Limitation

This study is limited by access to proprietary company data. While the case study reflects real-world practices through published data and tools, internal KPIs and full algorithmic details remain undisclosed. Moreover, the research focuses only on Avenue Fashion, which limits the generalizability to other fashion retailers.

Also further limitation includes:

Potential biases in social media data [5]

- Assumptions in algorithm efficiency based on publicly available performance metrics.
- Ethical implications of personalization algorithms, which may promote consumerism or filter bubbles [8]

Conclusion

Avenue Fashion's integration of big data analytics demonstrates the transformative potential of data in fashion e-commerce, underscoring its critical role in computer science and digital business strategy. Big data techniques—ranging from machine learning to real-time stream processing— are enabling scalable and intelligent platforms that can adapt dynamically to customer behaviors and market trends [7].

The application of distributed systems (e.g., Apache Hadoop), AI algorithms (e.g., neural networks for image recognition), and visualization tools (e.g., Power BI) highlights how deeply computer science underpins operational innovation in e- commerce. Furthermore, by embedding computer science principles into marketing, logistics, and design workflows, Avenue Fashion exemplifies how interdisciplinary integration leads to superior business outcomes [2].

Looking forward, the continued evolution of artificial intelligence and big data infrastructures will empower fashion retailers to develop more sustainable, ethical, and responsive business models. Future research could delve into the use of federated learning for privacy-preserving personalization, explore reinforcement learning for supply chain decisions, or develop explainable AI models for greater transparency.

A well-rounded approach involving both technological advancement and ethical stewardship will be crucial to ensuring that big data-driven ecommerce continues to grow in a way that benefits both businesses and consumers.

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