



AI-POWERED BODY SIZE MATCHING: A NEW PARADIGM FOR MICRO-INFLUENCER MARKETING IN FASHION E-COMMERCE

Professional paper
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ABSTRACT: Online shopping has become one of the most widely adopted consumption practices, offering undeniable convenience to consumers. At this stage, the critical challenge for retailers is no longer expanding access to online channels, but rather enhancing customer loyalty and delivering an optimal shopping experience. This challenge is particularly prominent in the fashion e-commerce sector, where the absence of physical interaction and the subjective nature of garment fit significantly affect consumer satisfaction.. Failure to find the appropriate fit or meet consumer expectations results in high return rates, creating additional costs and logistical burdens for both consumers and sellers. This study presents an innovative solution for the online marketing of apparel by introducing a body-matching algorithm that brings together individuals with similar body types within a dedicated mobile application platform. The developed system (ModaApp) enables users to match with others who share similar morphological characteristics, allowing them to observe how a garment fits on a "similar body double" and benefit from peer experiences before purchase. Furthermore, the study provides a robust infrastructure for micro-influencer marketing, allowing users to earn commissions through their shared experiences. Consequently, this model aims to minimize return-related issues in online apparel shopping, enhance the decision-making process, and foster a more sustainable e-commerce ecosystem.

Keywords: Body Matching Algorithm, Fashion E-commerce, Micro-influencer marketing, Virtual Fit, Sustainable Consumption.

USKLAĐIVANJE VELIČINE TELA POKRENUTO VEŠTAČKOM INTELIGENCIJOM: NOVA PARADIGMA ZA MARKETING MIKRO-UTICAJNIH KLIJENTA U MODNOJ E-TRGOVINI



APSTRAKT: Kupovina preko interneta postala je jedna od najšire usvojenih praksi potrošnje, nudeći neospornu pogodnost potrošačima. U ovoj fazi, ključni izazov za trgovce više nije proširivanje pristupa onlajn kanalima, već povećanje lojalnosti kupaca i pružanje optimalnog iskustva kupovine. Ovaj izazov je posebno izražen u sektoru modne e-trgovine, gde odsustvo fizičke interakcije i subjektivna priroda kroja odeće značajno utiču na zadovoljstvo potrošača. Neuspeh u pronalaženju odgovarajućeg kroja ili ispunjavanju očekivanja potrošača rezultira visokim stopama povrata, stvarajući dodatne troškove i logistička opterećenja i za potrošače i za prodavce. Ova studija predstavlja inovativno rešenje za onlajn marketing odeće uvođenjem algoritma za uparivanje tela koji okuplja pojedince sa sličnim tipovima tela unutar namenske platforme mobilnih aplikacija. Razvijeni sistem (ModaApp) omogućava korisnicima da se uparuju sa drugima koji dele slične morfološke karakteristike, omogućavajući im da posmatraju kako odeća stoji na „sličnom dvojniku tela“ i da imaju koristi od iskustava vršnjaka pre kupovine. Štaviše, studija pruža robusnu infrastrukturu za mikro-influenser marketing, omogućavajući korisnicima da zarađuju provizije kroz svoja zajednička iskustva. Shodno tome, ovaj model ima za cilj da minimizira probleme vezane za povraćaj robe prilikom kupovine odeće putem interneta, poboljša proces donošenja odluka i podstakne održiviji ekosistem e-trgovine.

Ključne reči: Algoritam za podudaranje tela, modna e-trgovina, mikro-influenser marketing, virtuelna forma, održiva potrošnja.

1. INTRODUCTION

The rapid development of digital technologies and the ease of access to online platforms have transformed e-commerce from an alternative channel into a dominant sector. Despite its advantages in attracting and engaging consumers, the lack of physical interaction remains an unresolved challenge in this environment. This issue is particularly critical in online apparel shopping, where the usability and satisfaction associated with purchased products are directly linked to how well they meet consumer expectations. The gap between experiencing a physical product and evaluating it in a virtual environment continues to be a significant barrier. As a result, unsuitable garments are frequently returned, leading to additional costs and time burdens for both consumers and retailers.

The return of online purchases should be evaluated from both the retailer's and the consumer's perspectives. Recent reports indicate that overall e-commerce return rates reached approximately 20% in 2024, marking one of the highest levels recorded [1]. These high return rates are influenced by several factors, including easy return policies and free return options, which have become standard practices in e-commerce. However, the issue is particularly pronounced in the apparel sector, where return rates can reach up to 40%, the highest among all product categories. In clothing retail, returns are primarily driven by size inconsistencies across brands and poor fit. In addition, consumers—especially Generation Z shoppers—often purchase multiple sizes of the same item with the intention of returning those that do not fit. Studies show that the most common reasons for returns



include sizing issues, dissatisfaction with the product, and discrepancies between the product description and the actual item [2]. These findings highlight a critical gap between the digital representation of garments and their real-world physical experience. This disconnect creates a significant barrier to informed purchasing decisions. Consequently, poor-fitting or unsatisfactory apparel leads to high return rates, imposing substantial logistical costs and time burdens on both consumers and retailers.

To enhance the interaction between online apparel products and consumers, various approaches have been proposed in the literature. Particularly, solutions addressing size and fit issues have attracted significant attention. For instance, Nasibov et al [3], introduced a method that recommends appropriate garment sizes based on body measurements calculated using fuzzy logic. However, this approach requires precise body measurements for both the consumer and the product, which limits its practicality in real-world applications. Beside, current literature presents several distinct technological approaches to solving the online apparel fit problem, ranging from article-centric Bayesian models like SizeFlags, which leverage noisy return data to identify problematic article behavior [4,5,] to machine learning frameworks that predict shirt and pant sizes with high accuracy based on basic metrics like height, weight, and BMI [6,7.] Other systems utilize standardized mapping, o extract user sizes and compare them against "coded" garment data [8,9], or personalized recommendation services which find fit similarities between a user's past successful purchases and new items across different brands [10,11.] While Virtual Fitting Room (VFR) and Augmented Reality (AR) solutions allow for 3D visualization, they are often limited by consumer privacy concerns and "unrealistic mapping" caused by graphical glitches in texture and positioning [12].

The proposed system, which matches consumers with similar body types, is considered superior because it addresses the inherently personal and subjective nature of garment fit, which is often not effectively captured by standardized national datasets and rigid algorithmic approaches. By utilizing real consumer data from individuals with similar body profiles, the system overcomes two major limitations of existing solutions: the "unrealistic matching" problem commonly found in avatar-based systems, and the "cold start" problem associated with new products that lack sufficient purchase history. Furthermore, the system directly targets the lack of physical experience, which is one of the primary drivers of the approximately 40% return rate in the apparel sector. It achieves this by enabling users to observe how garments appear on individuals with similar body types, while also providing direct access to user-generated feedback and reviews related to the product.

2. MATERIALS AND METHODS

The proposed system, ModaApp, shifts the focus from traditional garment-to-body measurement comparisons to a peer-to-peer "body similarity" model. The core objective of this methodology is to simplify data collection while enhancing the accuracy of visual fit perception through real-human data.

2.1. Data Acquisition and User Profiling



Instead of requiring professional-grade anthropometric measurements, the system utilizes a streamlined four-point data entry process to define a user's morphological profile. To access and categorize consumer data, the platform prompts users with four strategic questions: *Weight, Height, Upper Body Size (Based on recent purchases), Lower Body Size (Based on recent purchases)*

To refine the matching accuracy beyond standard S/M/L/XL labels, the system incorporates a "double-reference" check for sizing. For instance, a user who typically wears a 'Large' is asked to select their second most frequent size (e.g., L and XL or L and Medium). This approach allows the algorithm to identify the "size-edge" of the consumer. By determining whether a user leans toward a larger or smaller fit within a specific size category, the system achieves a more granular similarity mapping between users.

2.2 Peer-to-Peer Matching Mechanism

The algorithm processes these four parameters to find "body doubles" within the database with Euclidean distances and weight function in given Formula 1.

$$d(x, y) = \sqrt{\sum_{i=1}^n w_i (x_i - y_i)^2} \quad (1)$$

In the case of proposed system, each user registered and data of the user is collected as;
 $x = (\text{height}, \text{weight}, \text{upper size}, \text{lower size})$

Weighted Euclidean distance is employed to measure similarity between users' body profiles by assigning different importance levels to each anthropometric feature. While traditional distance measurements often assume that each physical attribute contributes equally to the similarity score, this approach frequently fails to represent complex body morphologies accurately. To overcome this limitation, a neural network architecture was designed to dynamically determine the discriminative power of each attribute, optimizing the coefficients within the weighted Euclidean formula during the learning process. This allows the model to better capture the subjective nature of garment fit and improve matching accuracy in fashion recommendation systems. The predictive performance of the developed model was evaluated using Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE) metrics. The results show that the neural network successfully learns appropriate weights with low error and stable performance. In particular, the low MAPE values indicate that the model maintains consistent accuracy across different body data ranges. Overall, the findings demonstrate that the proposed hybrid approach, combining neural networks with weighted Euclidean distance, provides more accurate and reliable body matching compared to traditional.

3. IMPLEMENTATION OF THE MOBILE PLATFORM

3.1. System Architecture and User Interface

The architecture of the mobile platform is designed to facilitate a seamless flow from raw data entry to a personalized social commerce experience. The system operates through a three-stage integration: data acquisition, algorithmic processing, and visual interaction.

User Profiling and Data Entry: Upon registration, the application initiates a streamlined onboarding process. Users are required to complete a simplified morphological form that includes gender, height, and weight.

Dynamic Similarity Algorithm: The backend engine utilizes a real-time similarity algorithm. Unlike static models, this algorithm performs a re-calculation every time a new user is added to the database. It computes a "similarity ratio" by comparing the morphological profiles of the target user against the existing database. This ensures that the proximity mapping remains precise and evolves as the community grows.

Interactive Social Interface: The UI/UX is centered around a personalized "Similarity Feed." In the profile and discovery screens, users interact with posts shared by their "body doubles." Each post contains several high-value data points:

Similarity Ratio: A percentage indicating how closely the creator's body type matches the viewer's profile.

Garment Metadata: Detailed information regarding the size and fit of the clothing shown.

Peer Insights: Qualitative comments from the creator about the garment's texture, stretch, and real-world comfort.

Direct Commerce Link: An integrated link that redirects the user to the retailer's website for an informed purchase. (Figure 1)

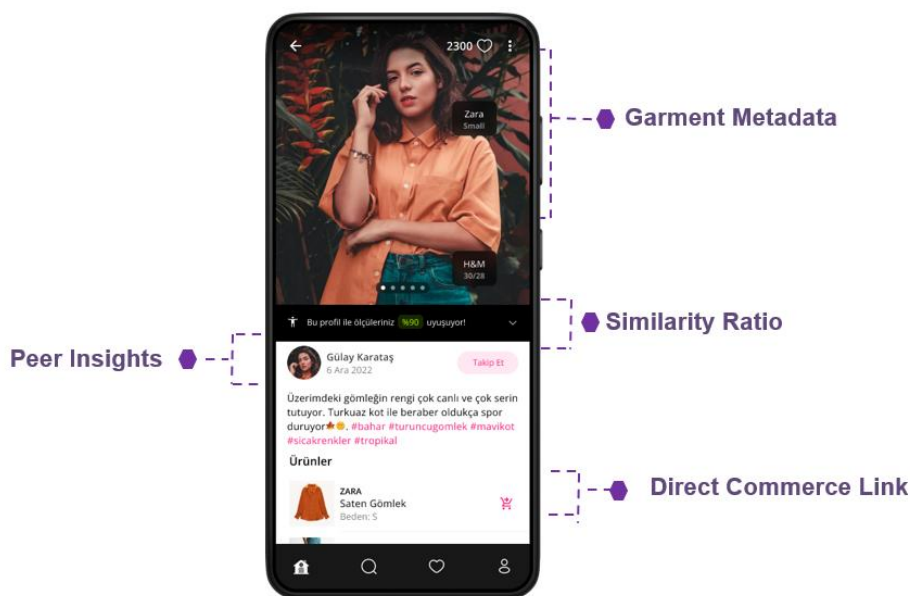


Figure 1: Image from ModaApp



4. CONCLUSION

The development of the proposed mobile platform has been successfully completed, and it is currently in its active operational phase. While the quantitative longitudinal data regarding long-term consumer behavior is still being collected, the structural impact of the system allows for an informed discussion on its potential outcomes. The primary result of the implementation is the successful elimination of the "visualization barrier." By allowing users to observe desired apparel on "body doubles" with high similarity ratios, the system provides a proxy for the physical trial room experience. By minimizing "sizing inaccuracies" and "aesthetic mismatch"—the two leading drivers of returns—the platform is expected to reduce the logistical footprint of e-commerce. This reduction directly contributes to the sustainability of the fashion industry by lowering the carbon emissions associated with reverse logistics. The platform is currently running in a live environment. Detailed statistical analysis regarding the exact reduction in return rates, conversion rate optimizations, and user retention metrics are under continuous monitoring.

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