

Virtual Try-On and the Retail Landscape



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Abstract

Virtual try-on (VTON) technology is the next logical step in retail previews of fashion products like clothes, accessories, makeup, and even certain hair products. Utilizing AI, VTON tech allows shoppers to see what a product will look like on them, reducing friction in the online purchasing process by increasing consumer confidence in their experience, the same way that brick-and-mortar fitting rooms do.

This is yet another example of a greater trend: AI providing more immersive, personalized shopping experiences. In addition to more basic features like smart product recommendations and self-service chatbots, VTON tech creates an online shopping experience that comes closer and closer to the conveniences of in-store without the extra effort and perceived pressure from sales staff, of which consumers are becoming increasingly intolerant. It can also be used to digitize in-store experiences to reduce friction in the same way for brick-and-mortar customers.

Using a combination of augmented reality (AR), 3D modeling, AI/machine learning, computer vision, and more, VTON tools provide cutting-edge value for consumers using some of the newest and best technology. This increases sales, cart size, and customer satisfaction while decreasing returns and customer service tickets. Using data-intensive technology like this comes with some ethical considerations regarding security and consumer privacy, so it is important to consider both the benefits and potential risks when mapping out the future of VTON adoption.

Changing the Retail Landscape

Traditional brick-and-mortar retail presents a number of challenges for consumers, which explains why sales growth has consistently been better for eCommerce than in-store sales, even as the effect of the pandemic on in-store sales has waned.

These include:

✦ **Fitting Room Limitations**

Few/no fitting rooms in stores of all sizes can cause issues for customers who want to try before they buy.

✦ **High Return Rates**

Lack of access or high wait times for fitting rooms don't always stop consumers from purchasing, but they can cause higher return rates since they are forced to test the fit and style of their products at home.

✦ **In-Store Stock Limitations**

Brick-and-mortar stock is inherently limited, and this can frustrate consumers who come in person to try on a product just to discover it is out of stock at their local store.

✦ **Perceived Sales Pressure**

Even as businesses have become more aware of the downsides of aggressive sales tactics and trained their staff to be more assistive than assertive, the perception that they may be "sold to" can keep customers from seeking assistance from an in-store staff member

Online shopping has been increasingly used by shoppers who want to avoid in-store sales pressure, stock limitations, and the effort of traveling to shop. The issue with online storefronts, though, has been the lack of assistance or personalization. This means that the demand for better consumer engagement online is higher than ever, and businesses that adopt the right new tech can provide better service to customers regardless of where they shop.

Enter Virtual Try-On

VTON technology bridges the gap between online and in-store shopping, adding in-store personalization to online shopping and digital convenience to in-store shopping. Online shoppers can now “try on” clothes at any time, from anywhere, and with zero in-store stock limitations. In-store customers can now skip the fitting room line and avoid in-person staff if desired by using a self-service kiosk that can provide them with similar utility, all while also forgoing any in-store stock limitations.

AI’s role in VTON offerings and other personalization tools for retail customers cannot be understated. Well-built AI is necessary to allow all of the disparate technologies used for VTON to work in concert to provide a truly valuable experience. In this paper, we will cover the technical innovations that opened the door for VTON, how they affect the customer journey, the impact it has on businesses that adopt and offer it, and the ethical considerations that must be made when increasing demand for customer data with these new technologies.

The Consumer Journey: A VTON Example Use Case

Meet Alex. Alex is a modern shopper who appreciates convenience as much as personalization. While he appreciates the ability to try on clothes in-store, he isn’t a fan of dealing with in-store salespeople and has a busy work schedule that makes it hard to go out and shop during regular business hours.

As a result, he shops online but struggles to imagine how new clothes will fit his current style. This makes him more hesitant to purchase large carts online for fear that he will have to go through the hassle of returning anything he doesn’t like. So, he has been stuck in a loop of buying one or two clothing items at a time but is now actively searching for ways to shop online with more confidence so that he can finally build out his wardrobe.

This leads Alex to a store that advertises a new virtual try-on app, and he is excited to finally be able to see what things look like on him. The process of using the app is simple, and the app walks him through the steps.

Step 1: Initialization and Hardware Access

He starts by opening the app on his phone, and it has him confirm access to his phone camera and/or necessary photos in his library.

Step 2: Body Scanning

After providing the proper permissions, Alex is told to set his phone up to take some pictures of his body in a well-lit area with a light background that allows for a clear silhouette. He is also given the alternative option to provide an existing photo of his body that meets that criteria, but he chooses the real-time photo option as the app assures that this will likely provide a more accurate preview, and he is at home anyway.

The app then accepts his photos and begins to scan them right away. After only a short time, the app confirms that it has successfully mapped his body for VTON using advanced computer vision and machine learning.

Step 3: Garment Selection

After mapping his body, the app then takes him to a storefront that looks similar to online shopping apps he has seen, but with some convenient AI automations to complement the try-on technology, like garment pairing/layering recommendations based on what products he has tapped on.

While he browses, he selects some garments that he wants to try on.

Step 4: Overlay and Adjustment

Once he selects the garment he wants to try on, the app pulls up the scanned image he provided to overlay the product onto it. It attempts to place the garment as true-to-life as possible while offering real-time adjustment tools so that Alex can change the position of the garment relative to his body.

While the app does a good job providing accurate placement, Alex appreciates these adjustment features for garments like pants that he tends to wear in different positions for different outfits, playing with where the belt line sits relative to his waist on the VTON image to see how the pants will look if he wears them a bit lower than his natural waist.

Step 5: Additional Assistive Features

As Alex tries on different garments and adds a few to his cart, he realizes that the retailer he is shopping with has made the most of their investment by offering AI-assisted garment recommendations based on the things he has tried on. He sees a recommendation he likes, and is pleased as he is able to tap a shirt that the app recommended to wear with the pants he had pulled up and have it overlaid simultaneously, allowing him to get an accurate look at the entire outfit at once.

After realizing this, he selects a few garments that look similar to his existing clothes to see how some of the garments he is trying on will look when paired with clothes he already has. This makes him much more confident that they'll fit his desired look, and he ends up adding a few more products to his cart than he usually does.

Step 6: Streamlined Purchase Process

After adding clothes to his cart, the app makes it simple to store his preferred payment option securely or use the mobile wallet payment option his phone uses, giving him an easy one-click checkout process. This is the cherry on top of an online shopping experience that has changed the way Alex shops forever; first, in that this retailer is now his go-to for clothing, and second in that he now wonders if there are hat and accessory retailers that can offer him the same service.

Technical Deep Dive

To get a more in-depth picture of how VTON works, let's dive into the technology behind each process and how they are able to work together to achieve such a complex and novel outcome.

Image Generation Techniques

There are a few image generation techniques that are leveraged to provide different VTON experiences:

Generative Adversarial Networks (GANs)

GANs work by pairing an image generator and an image discriminator together, and they're used to allow 2D garment images to warp properly with the pose of a body in an image. These struggle with occlusive poses like crossed arms that cause parts of the original 2D image to be layered over one another.

Diffusion

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Transformers

Transformers are used to improve the alignment of images generated using the other two technologies and resolve occlusions, but are the least commonly used technique.

These image generation techniques are used for more advanced functions that make the VTON experience more dynamic and personalized, like human pose estimation and body shape detection. Accurate simulations can be made harder when the body scan image involves a complex pose or when the user has a more unique body shape, which makes this tech essential since consumers with these body shapes are the ones that need tech like this the most, as they are most likely to experience severe disparity between online sample garment images and their real-life fit.

Clothing Simulation Innovations

To serve more complex customer needs even better, developers have come up with the following clothing simulation innovations:

Garment Warping / Texture Mapping

Improvements in the way VTON tools can simulate the drape and texture of a garment using a simple 2D image allow for truer-to-life simulations.

3D Body Modeling & Adaptive Fit Prediction

Better body modeling and fit predictions that account for the size and shape of a body in 3D are the only way to truly simulate the way a garment will fit when put on.

AR Integration w/ Real- Time Rendering

AR integration allows for real-time simulations, with images being rendered as a person moves to give a true fitting room experience.

Breakthrough Approaches in VTON

As these technologies and innovations have hit the market, it has resulted in new and novel approaches to VTON:

- **Image-Based/Video-Based VTON:** Better technology means a wider variety of images can be used for body scanning, allowing users to import their own images and videos instead of just taking new ones with strict criteria or having to have their bodies scanned, as was the case with the first iterations of garment simulation tech.
- **AR-Integrated Immersive Experiences:** AR tech allows for a more accurate fitting room experience that simulates accessories in real time on a live video of a body.
- **Multi-Angle and 360-Degree Visualization:** Improving image generation tech allows for garment visualization from all angles, which is important for many garments that have as much detail from the side and rear as they do from the front.

Real World Applications

Example 1: Warby Parker Virtual Eyewear Try-On

Eyewear retailer Warby Parker was one of the first brands to adopt VTON, as their eyewear business lent itself well to relatively basic and lower-cost VTON technology to provide a sufficient user experience since there is little need for more complex 360-degree simulations or fabric simulation. Their initial USP also involved their popular home try-on service, so it was a natural evolution to become a first adopter for easy online try-on tech as well.

Their program uses computer vision to analyze a user's face shape and skin tone to provide a personalized fit recommendation for both prescription glasses and sunglasses.

Example 2: Sephora

Virtual Makeup Artist

Sephora is a popular cosmetics retailer that offers a version of VTON that focuses on makeup products. Users allow the app to scan their face shape and skin tone and either allow the app to create a look for them or pick out products on their own to try on virtually. Any mix of the two is possible, allowing users to start with what they like and use the app to add creative twists to the looks they start.

It is important to note that the products available are somewhat limited, but as the technology improves, more and more possibilities will become available for their customers. This means their online interface is on the way to becoming a true studio experience.

Example 3: Zalando

Virtual Fitting Room

Zalando is a clothing manufacturer and retailer that has launched limited VTON campaigns to test the feature, and their VP of Size and Fit claims over 30,000 of their customers have tried it. Their virtual fitting room uses VTON image generation technologies in many of the ways we've discussed in this paper, with the primary goal of providing a fitting room experience for clothing through 3D body scanning and garment simulations.

Economic and User Experience Impact

At the core of every retail innovation is consumer demand, and meeting consumer demand is almost necessarily going to have economic benefits and improve your user experience. There are some common ways that this typically manifests for our clients and other businesses that adopt virtual try-on tools.

Business Benefits

The following KPIs are the ones we see move the most for retail clients that leverage tools like VTON:

- **Conversion Rates:** Shoppers are more likely to buy when the customer experience is good and they have more confidence in their products.
- **Return Rates:** Return rates drop as customers have more clarity as to what products fit them well, and can eliminate ones that don't before they ever order them.
- **Costs:** Cost reduction usually comes in the form of fewer physical samples and returns.

Enhanced User Experience

The user experience is improved as well, with greater customer engagement due to the convenience, novelty, and “fun factor” of VTON tools. Customer confidence in their purchases will be higher after they've seen the clothes on them as well, and VTON tools improve inclusivity by providing an easy, private fashion exploration tool for a diverse range of body types.

Ethical Considerations and Societal Impact

There are a number of considerations that come with such a data-intensive tool, both in terms of minimizing negative impacts and maximizing positive ones. The following are the ethical considerations that we most commonly think of when discussing VTON and other AI technologies:

- **Privacy and Data Security:** Businesses should be cognizant of the heightened level of data required to leverage AI tools, and be sure to invest in equally cutting-edge security tools concurrently with VTON tech.
- **Inclusivity and Representation:** Retail industries like fashion and cosmetics have a spotty history in regard to inclusivity and representation. Investing in more capable VTON tools isn't just about more accurate and fiscally effective experiences, but also experiences that can accommodate a diverse range of skin tones and body types to ensure that their UI sets the standard for more ethical and accessible fashion, not less.
- **Ethical Use of AI:** Using AI effectively in the context of VTON means avoiding body image stereotyping by using more advanced tools that are capable of providing a more equitable experience.

Challenges and Solutions in VTON Implementation

There are two primary hurdles to implementing innovative VTON tools. The first is getting advanced enough technology to handle diverse body types, simulate fabric accurately, and/or provide real-time rendering for AR functionality. The second involves integrating this technology with existing retail systems that don't typically handle anything close to the complexity or processing demands of VTON.

Strategies for Overcoming Challenges

The best way to overcome all of these technical challenges is to seek out expert advice from authoritative sources on innovative approaches to VTON technology and best practices for effective deployment. One of the most important is simply laying out a minimum viable product (MVP) for your VTON tool and not getting lost in the depth of AI's capabilities.

Keep your investment focused on the features your product needs, and perform test campaigns to ensure that it operates the way it needs to. Once you've nailed your MVP, you can work on more seamless integration before adding extra features that could make your solution harder to integrate and deploy.

Future Directions and Emerging Trends

VTON is a fairly novel technology, and it is important for early adopters to understand where it is headed as time goes on and consumers become more aware and open to using it. We've already seen pretty strong trends regarding the technology being used, new markets, and more.

Emerging VTON Trends

Advancements in AI and AR

Next-generation algorithms will bring even more realistic try-ons that can work off a wider variety of source images.

Expansion Into New Markets

VTON is already being applied outside of fashion retail to markets like cosmetics and eyewear, with even more on the horizon, like furniture and home goods.

The Metaverse and Beyond

The Metaverse provides ample opportunity and high demand for potential VTON use in creating more immersive environments and avatars.

To prepare for these trends, we recommend firms either analyze companies that use the tech themselves to watch for them as they arise, or reach out to experts in the field to understand exactly where the tech is now, where it's going, and be aggressive about seeking applications in their industry and market even if there aren't examples just yet.

Conclusion

AI-powered virtual try-on transforms retail by blending technical innovations with enhanced customer experiences. There are benefits on both the retailer and consumer sides, and endless possibilities for new markets to leverage or adapt the technology to their use cases.

The key is in balancing technological innovation with ethical responsibilities, which means putting equal focus on your business's bottom line and your consumer's privacy, security, and comfort using your software platform. All of this also must be accomplished by developers in a way that is sustainable, scalable, and adaptable to new market opportunities.

Overall, VTON technology is a true win-win for businesses and consumers, and is likely the future of an increasingly online retail space. Businesses that want to remain competitive in this modern shopping environment should seek out consultation or development of similar tools sooner rather than later.



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