

GarmentIQ: Automated Garment Measurement for Fashion Retail

Li Yuan¹, Xinrui Zhai¹, Fangzhou Ma¹, Adrián González-Sieira², Laura Rodríguez², Prof. Elliott Ash³

¹ETH Zurich Student, D-INFK ²Inditex, Spain ³ETH AI Center, ETH Zurich

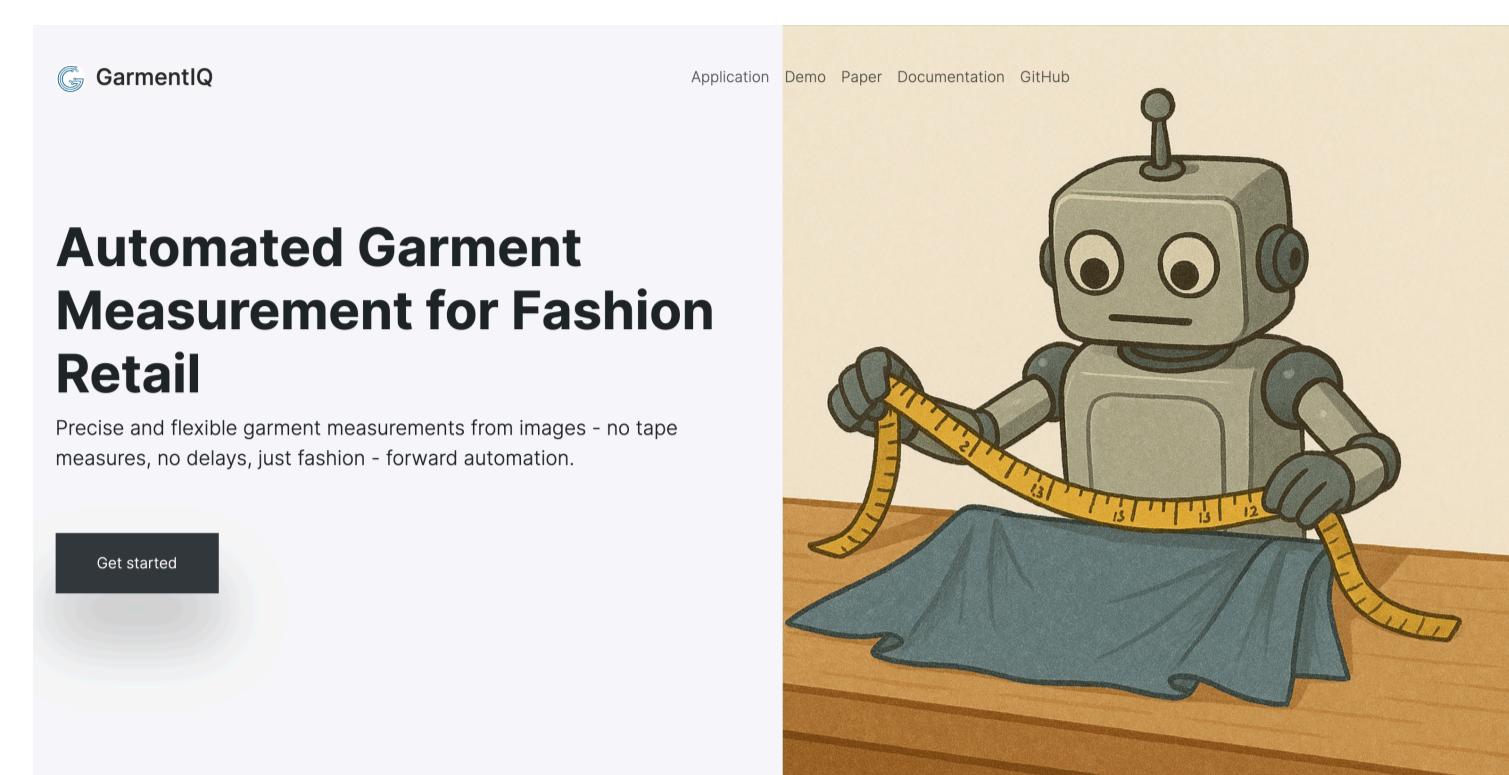


Figure 1: Scan to access GarmentIQ website

1. Problem Statement

- Online fashion retail suffers from high return rates (25%) due to poor sizing.
- Manual garment measurement is slow and error-prone.
- Leads to financial losses and environmental waste.
- Develop an automated pipeline to measure garments based on image.

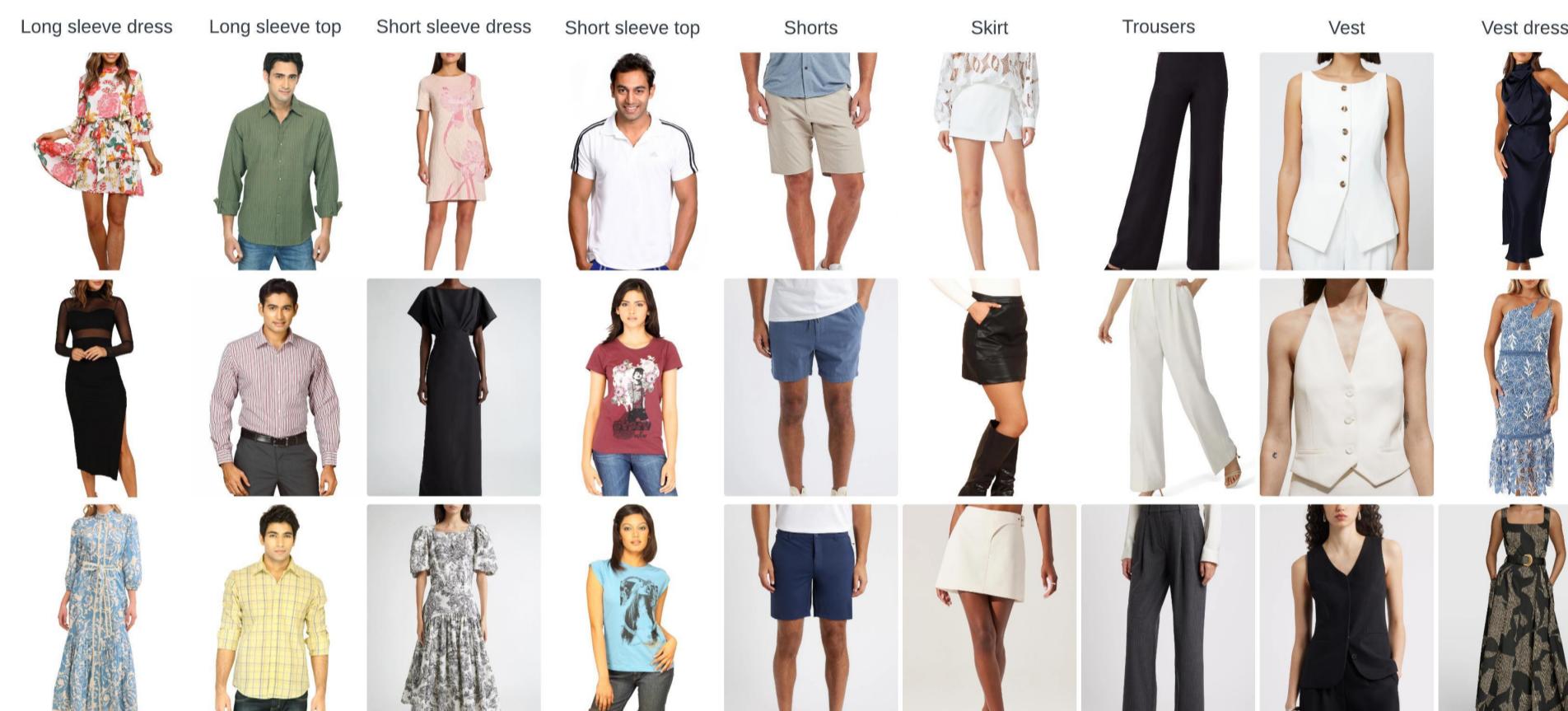


Figure 2: Sample images from Nordstrom & Myntra data.

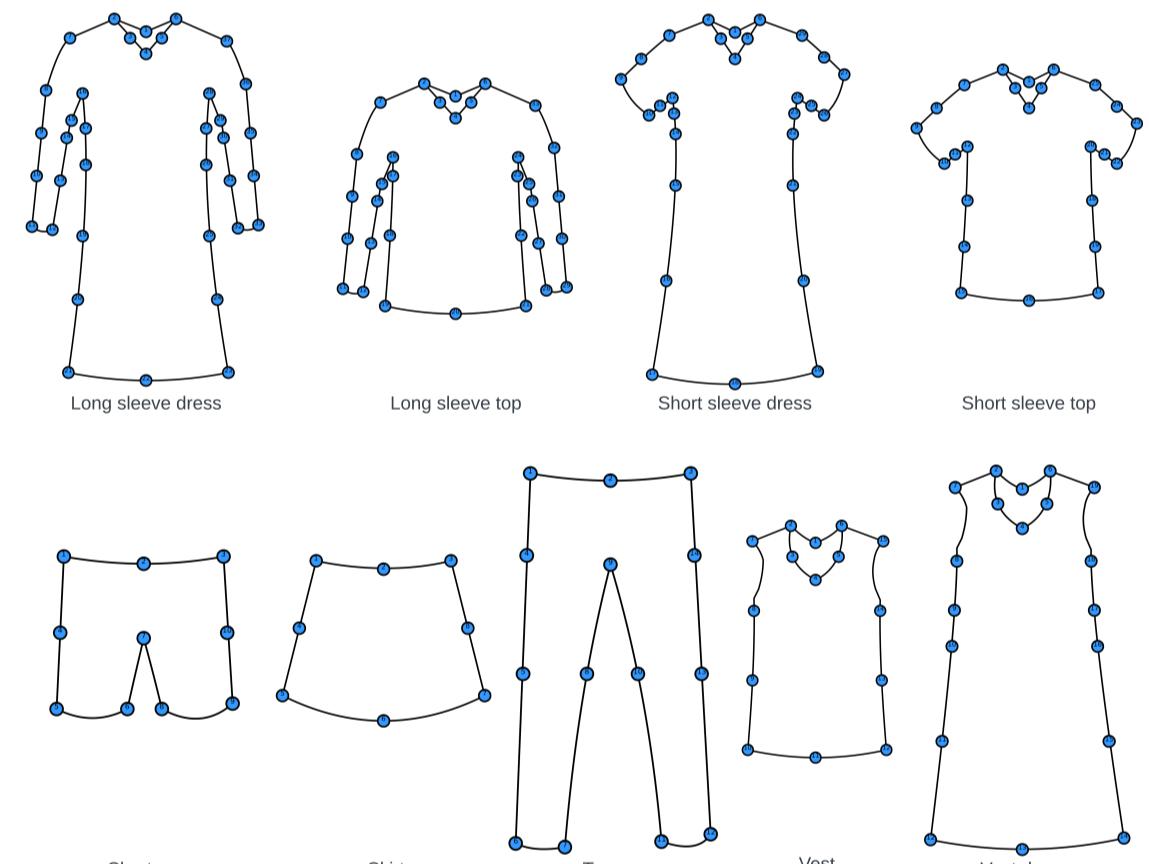


Figure 3: DeepFashion2 predefined landmarks.



Figure 4: Background-modified trousers.

2. Related work

- Earlier methods used HOG + SVM or CNNs with moderate accuracy.
- DeepFashion2 advanced landmark detection and segmentation.
- No prior work combined classification, segmentation, and landmarking into one unified system.

3. Data

- 23,266 images from Nordstrom & Myntra across 9 garment categories (Yuan, 2025a).
- 834 Zara images used for fine-tuning (Yuan, 2025b).
- DeepFashion2 dataset has 491K images of 13 clothing types where each item in an image is labeled with scale, occlusion, zoom-in, viewpoint, category, style, bounding box, dense landmarks and per-pixel mask (Ge et al., 2019).
- 90 images manually annotated using self-developed web interface and used for landmark accuracy evaluation.

4. Methods

- Classification: Custom CNNs and tinyViT; tinyViT reached 95.76% accuracy.
- Segmentation: BiRefNet used for fine-grained garment masks.
- Landmark Detection: HRNet model on DeepFashion2, extended with custom landmark derivation via geometric rules.
- Measurement Tool: Interactive web interface to define landmarks and export JSON + PDF.

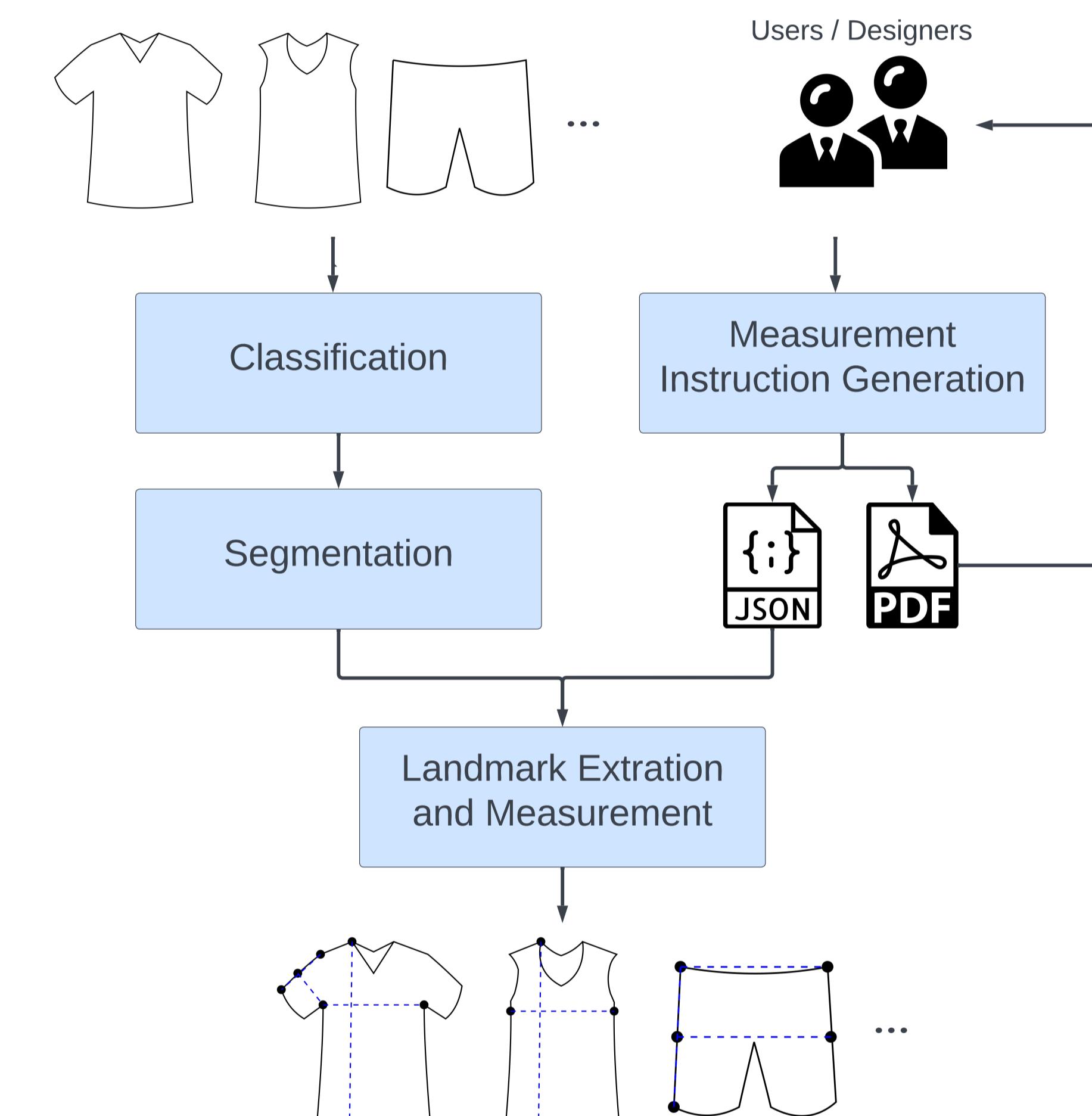


Figure 5: An overview of the GarmentIQ pipeline.

5. Results

- tinyViT achieved highest accuracy (95.76%) and best domain transfer to Zara images.
- Low error (<6%) on chest and front-length measurements.
- Custom landmarks performed well; some errors for skirt/shorts due to ambiguous hip regions.
- Background replacement and Gaussian smoothing provided modest improvements.

6. Conclusions

- GarmentIQ delivers a modular, scalable, and accurate pipeline for automated garment measurement.
- Combines classification, segmentation, and keypoint extraction in one end-to-end system. Reduces measurement time and enhances fit accuracy in fashion retail.

7. Future Work

- Add autonomous pipeline agents (e.g., GPT-based). Improve model robustness on difficult garments and unseen types.
- Finetune the general landmark detection model on each type of garment separately. Integrate advanced generative techniques (e.g., MetaCloth) for complex landmark detection.

References

- Yuying Ge, Ruimao Zhang, Lingyun Wu, Xiaogang Wang, Xiaou Tang, and Ping Luo. Deepfashion2: A versatile benchmark for detection, pose estimation, segmentation and re-identification of clothing images, 2019. URL <https://arxiv.org/abs/1901.07973>.
Li Yuan. Nordstrom & myntra clothes image data - garmentiq, 2025a. URL <https://www.kaggle.com/ds/7099732>.
Li Yuan. Zara clothes image data, 2025b. URL <https://www.kaggle.com/dsv/11787792>.

Contributions

- S1: Methodology (classification, measurement instruction schema design, workflow design), Software (classification, segmentation code organization, instruction generation, website interface), Investigation, Writing - Original Draft
S2: Methodology (initial instruction schema idea, landmark extraction, workflow design), Software (landmark extraction refinement, and derivation implementation), Investigation, Writing - Original Draft
S3: Methodology (initial instruction schema idea, landmark extraction, refinement and derivation), Software (initial segmentation implementation, landmark extraction, refinement, and derivation implementation), Investigation, Writing - Original Draft
CG: Conceptualization, Supervision (practical), Methodology, Project Administration
AC: Supervision (nominal)