WCCA-AK: A Multimodal Dataset of André Kim's Fashion Legacy for AI-Driven Cultural Heritage Research

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Abstract

In this paper, we present WCCA-AK, a large-scale dataset of 3D scans and multi-view images capturing 100 haute couture garments by André Kim (1962–2010). The dataset supports tasks in 3D reconstruction, generation, and computational analysis, while serving as a bridge between computer vision research and cultural heritage preservation. To ensure responsible use, we establish an ethical framework that addresses the dual role of digital archives: faithfully documenting historical artifacts and enabling generative continuations of artistic vision. This duality reframes cultural preservation from static documentation into generative exploration, allowing computational methods to both honor historical legacy and inspire future creativity. WCCA-AK thus functions as (1) a high-fidelity archive of André Kim's work and (2) a foundation for studying how artistic style evolves and can be computationally extended while maintaining cultural authenticity. Looking ahead, we aim to expand the collection to 1,000 garments and extend the methodology to other designers. We invite researchers in computer vision, machine learning, and digital humanities to leverage WCCA-AK to advance both technical innovation and cultural understanding, ensuring that artistic legacies continue to inspire future generations.

1. Introduction

Fashion heritage preservation presents unique challenges due to the complex interplay of materiality, movement, and cultural context inherent in clothing design. This paper introduces WCCA-AK, a comprehensive multimodal dataset capturing the artistic legacy of André Kim (1935-2010), who established Korean haute couture on the international stage over his five-decade career. His designs, characterized by dramatic silhouettes, intricate embellishments, and signature use of white, represent a fusion of Eastern aesthetics and Western couture techniques. To preserve this cultural legacy and enable computational research, the WCCA-AK dataset addresses the lack of comprehensive fashion heritage datasets suitable for computer vision and AI research. Unlike commercial fashion datasets prioritizing e-commerce applications, WCCA-AK provides 3D scans and multi-view images curated for cultural heritage research.

The dataset contains 100 meticulously selected garments, each recorded using high-precision 3D scans and multi-view photography. Our contributions are threefold. First, we present a large-scale single-designer digital archive that, to our knowledge, is the first to capture the interplay among 3D form, material properties, and garment structure in haute couture. While comparable single-artist archives exist in visual arts and literature, fashion introduces distinct technical hurdles that have remained unresolved until now. Second, we develop and detail robust methodologies for digitizing haute couture, with solutions tailored to the difficulties posed by intricate materials and construction techniques. Third, we propose a framework for incorporating ethical considerations into the digitization and computational analysis of artistic legacies.

The dataset enables research at the intersection of computer vision, machine learning, and cultural studies. Potential applications include style transfer, temporal analysis of design evolution, multi-modal fashion understanding, and generative modeling for culturally-informed design.

2. Related Work

2.1. Digital Heritage Preservation

The *Open Heritage 3D* project [4] demonstrates large-scale architectural preservation, while *Europeana Fashion* [5] aggregates digitized fashion collections from European museums. These initiatives primarily focus on object-level preservation rather than capturing complete creative context. Recent advances in neural rendering [11] and surface reconstruction [21] enable sophisticated heritage capture,

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Dataset	Scale	Modalities	Focus	Heritage
DeepFashion3D	2,078	3D, Image	Commerce	Low
Cloth3D	8,000+	3D, Synthetic	Simulation	None
SIZER	2,000+	3D, Parametric	Fitting	None
Digital Wardrobe	1,500	3D, SMPL	Animation	Low
WCCA-AK	100*	3D, Image	**Artist Legacy**	**High**

Table 1. Comparison of fashion datasets. Heritage levels indicate focus on cultural preservation versus commercial applications. *Initial release with plans to expand to 1,000 items.

but fashion presents unique challenges due to fabric complexity.

2.2. Fashion Datasets and Computational Fashion

Transitioning from general heritage preservation to fashion-specific datasets, most existing resources are primarily developed for commercial purposes. DeepFashion [10] offers annotated images for attribute prediction, DeepFashion3D [22] provides 3D garment models, Cloth3D [1] contains large-scale synthetic garments, and SIZER [18] focuses on garment fitting tasks. Table 1 compares WCCA-AK with representative fashion datasets, highlighting its unique commitment to cultural heritage and artistic preservation. Unlike these datasets, WCCA-AK captures the full creative process of a single fashion designer and enables research on stylistic evolution and culturally grounded generation, capabilities that existing collections rarely support.

2.3. Generative Models for Fashion and Art

Beyond dataset construction, generative models in fashion include GANs for design generation [16], virtual try-on [7], and diffusion models for synthesis [15]. In cultural heritage, generative models support restoration [19] and style analysis [6].

2.4. 3D Garment Reconstruction and Modeling

Addressing these challenges in three dimensions, 3D garment reconstruction includes single-view methods [3, 12] using parametric models and multi-view approaches [14, 20] with geometric constraints. Neural garment representations [2, 17] combine learning with physical constraints. WCCA-AK contributes high-fidelity scans of haute couture garments with complex materials that challenge existing reconstruction methods, particularly through elaborate embellishments and unconventional materials characteristic of André Kim's designs.

3. Dataset Construction

3.1. Garment Selection and Curation

The construction of WCCA-AK began with careful curation from the André Kim Design Atelier's archive of over 2,000 garments. Our selection process balanced temporal coverage across five decades, typological diversity (As shown in Figure 1, evening gowns, wedding dresses, suits, theatrical costumes), technical variety in construction and materials, and cultural significance. Each garment underwent condition assessment to ensure safe 3D scanning.

Figure 1. A selection of garments from the André Kim Atelier, considering diversity in design and color.

3.2. 3D Scanning Pipeline

Following garment selection, our 3D digitization pipeline employs photogrammetry-based reconstruction using a custom-built capture system for haute couture garments.

We use 88 synchronized Nikon D5600 cameras in a cylindrical rig. Fourteen vertical poles hold six cameras each at 0.3 m to 2.1 m heights. Four additional frontal cameras capture details. Garments are mounted on adjustable mannequins sized to original specifications.

3.3. Multi-view Image Acquisition

All cameras capture 24-megapixel RAW images simultaneously (ISO 100, f/29, 1/200s) through centralized triggering, with optional multi-exposure HDR bracketing for challenging materials. Image sets undergo immediate quality verification before garment removal. For the processes in Sections 3.2 and 3.3, see Figure 2 and Figure 3.

3.4. 3D Reconstruction and Processing

From these calibrated images, we employ RealityCapture 2.0 for reconstruction, processing each 88-image exposure set into dense point clouds (10-50M points). Poisson surface reconstruction [8] within RealityCapture generates watertight meshes (500K-2M triangles). Texture maps (8192 × 8192 pixels) use gradient-domain blending [13] to preserve embroidery and fabric details. The scanning results are attached in the following Figure 4 and Figure 5.

Figure 2. 3D scanning equipment and mannequins for dressing up clothes

Figure 3. Garment on adjustable mannequin within the 88-camera cylindrical array with controlled lighting for photogrammetric reconstruction.

4. Discussion

4.1. Technical Challenges and Limitations

While WCCA-AK advances fashion heritage digitization, several technical challenges remain. Figure 6 illustrates artifacts on reflective sequins and transparent fabrics, including geometric noise and incomplete geometry. Our HDR approach partially addresses these issues, but neural material modeling [9] could improve surface capture. Static scans cannot capture fabric dynamics, and linking static geometry to dynamic behavior remains challenging without accurate material parameters. The 100-garment release represents a fraction of André Kim's output, limiting statistical power for ML applications. Planned expansion to 1,000 garments faces resource constraints. Older garments show degradation. Reconstructing original appearance raises authenticity questions in digital preservation.

4.2. An Ethical Framework for WCCA-AK

To guide responsible use of the WCCA-AK dataset, we establish the following ethical framework based on four core principles:

Principle of Attribution and Provenance: All derivative works, publications, or models using WCCA-AK must provide clear and prominent attribution to the André Kim Design Atelier and dataset creators. This ensures proper acknowledgment of the cultural heritage source and maintains transparency in the data lineage.

Principle of Authenticity and Integrity: AI-generated designs derived from the dataset must be explicitly and unambiguously labeled as computational creations to distinguish them from André Kim's original works. This prevents public confusion and preserves the integrity of the artist's authentic legacy while enabling innovative research.

Principle of Non-Appropriation and Contextual Respect: The dataset should not be used in ways that decontextualize, trivialize, or misappropriate the cultural and historical significance of André Kim's designs. Users must consider the Korean cultural context and the designer's artistic intent when developing applications or generating new content.

Principle of Responsibility and Accountability: Researchers and developers are responsible for considering downstream societal impacts of models trained on this data, including potential biases, misrepresentations, and equi-

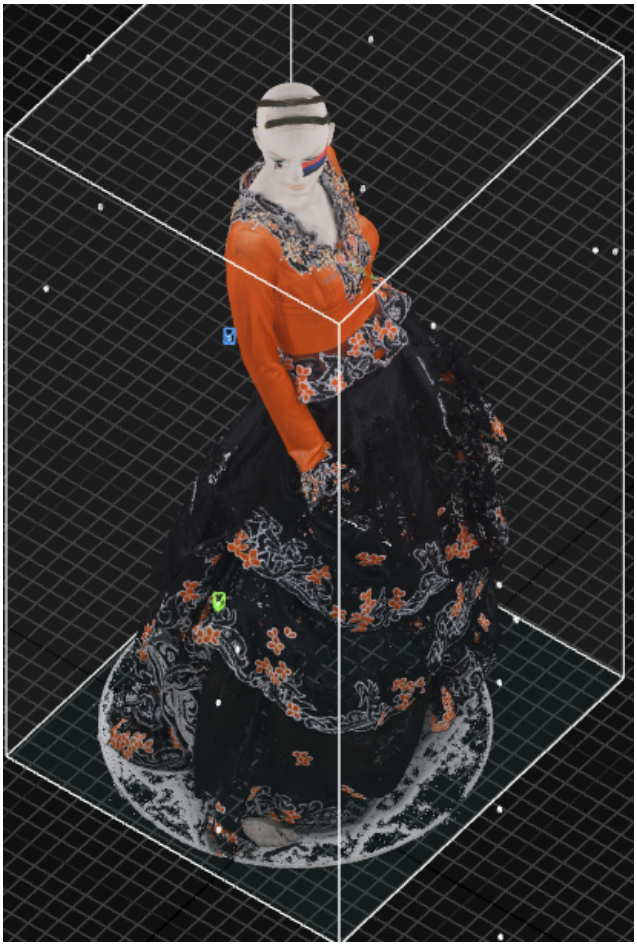

Figure 4. The result of converting images taken from 88 cameras into 3D using RealtyScan2.0. Since the skirt part is made of a material that transmits light, you can see that the mesh is broken here and there.

Figure 5. The result of converting images taken from 88 cameras into 3D using RealtyScan2.0. When a fancy pattern is drawn on a plain fabric that hardly transmits light, the mesh rarely breaks.

table access. We encourage open dialogue about these implications. As described in Section 3.6, we provide lightweight versions to ensure broader accessibility.

These principles, while essential, contain inherent tensions that researchers must navigate. The most significant tension exists between the Principle of Authenticity and Integrity and our goal of enabling generative exploration. A key tension is the line between respectful homage and digital forgery. While labeling AI-generated content is necessary, it may not be sufficient when models become sophisticated enough to create convincing imitations. The Principle of Non-Appropriation faces particular complexity given André Kim's dual identity as both a Korean national treasure and an international fashion icon. His work deliberately bridges Eastern and Western aesthetics, making it challenging to define what constitutes appropriate cultural context. Researchers must balance preserving the Korean cultural significance of his work while acknowledging its global influence and appeal. These tensions are not weaknesses but rather reflect the genuine complexity of working with cultural heritage in the age of generative AI.

4.3. Broader Implications for Digital Heritage

WCCA-AK offers lessons extending beyond fashion. Single-artist focus enables deep creative process understanding, applicable to other artistic media. WCCA-AK transforms heritage from static archive to dynamic computational resource.

4.4. Interdisciplinary Opportunities

The dataset creates bridges between traditionally separate fields. Cross-disciplinary collaboration yields insights impossible from single perspectives. WCCA-AK provides a case study for ethical discussions on AI-generated cultural

Figure 6. 3D reconstruction artifacts on sequined and transparent materials. Geometric noise and incomplete meshes result from non-Lambertian reflections violating photogrammetry assumptions.

heritage. The project exemplifies digital humanities, supporting fashion design education and cultural studies.

4.5. Future Directions

Several research directions emerge from our work. Future developments include: improved material modeling combining visual and tactile sensing; VR/AR applications for immersive exploration; cross-dataset integration for broader pattern analysis; and standardized digitization protocols for global fashion archives.

4.6. Community Building

Ultimately, WCCA-AK's success depends on fostering an active research community through workshops, online platforms, educational collaborations, and museum partnerships to ensure André Kim's legacy continues to inspire both technological innovation and creative expression.

5. Conclusion

We presented WCCA-AK, a dataset of 3D scans and multi-view images capturing 100 haute couture garments by André Kim (1962–2010). Beyond enabling tasks in 3D reconstruction, generation, and analysis, the dataset bridges computer vision and cultural heritage preservation. Our ethical framework underscores the dual role of digital archives—documenting historical artifacts while enabling generative continuations of artistic vision. This reframes preservation as generative exploration, honoring legacy while inspiring new creativity. WCCA-AK thus serves both as a high-fidelity archive and a foundation for studying and extending artistic style under cultural authenticity. Future work will expand to 1,000 garments and additional designers, fostering research across vision, machine learning, and digital humanities to ensure artistic legacies continue to inspire future generations.

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