

Novelty Assessment Report

Paper: Dynamic Texture Modeling of 3D Clothed Gaussian Avatars from a Single Video

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Abstract

Recent advances in neural rendering, particularly 3D Gaussian Splatting (3DGS), have enabled animatable 3D human avatars from single videos with efficient rendering and high fidelity. However, current methods struggle with dynamic appearances, especially in loose garments (e.g., skirts), causing unrealistic cloth motion and needle artifacts. This paper introduces a novel approach to dynamic appearance modeling for 3DGS-based avatars, focusing on loose clothing. We identify two key challenges: (1) limited Gaussian deformation under pre-defined template articulation, and (2) a mismatch between body-template assumptions and the geometry of loose apparel. To address these issues, we propose a motion-aware autoregressive structural deformation framework for Gaussians. We structure Gaussians into an approximate graph and recursively predict structure-preserving updates, yielding realistic, template-free cloth dynamics. Our framework enables view-consistent and robust appearance modeling under the single-view constraint, producing accurate foreground silhouettes and precise alignment of Gaussian points with clothed shapes. To demonstrate the effectiveness of our method, we introduce an in-the-wild dataset featuring subjects performing dynamic movements in loose clothing, and extensive experiments validate that our approach significantly outperforms existing 3DGS-based methods in modeling dynamic appearances from single videos.

Disclaimer

This report is **AI-GENERATED** using Large Language Models and WisPaper (a scholar search engine). It analyzes academic papers' tasks and contributions against retrieved prior work. While this system identifies **POTENTIAL** overlaps and novel directions, **ITS COVERAGE IS NOT EXHAUSTIVE AND JUDGMENTS ARE APPROXIMATE**. These results are intended to assist human reviewers and **SHOULD NOT** be relied upon as a definitive verdict on novelty.

Note that some papers exist in multiple, slightly different versions (e.g., with different titles or URLs). The system may retrieve several versions of the same underlying work. The current automated pipeline does not reliably align or distinguish these cases, so human reviewers will need to disambiguate them manually.

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Core Task Landscape

This paper addresses: **Dynamic Appearance Modeling of Loose Clothing in 3D Gaussian Avatars**

A total of **15 papers** were analyzed and organized into a taxonomy with **11 categories**.

Taxonomy Overview

The research landscape has been organized into the following main categories:

- **Physics-Based Cloth Simulation and Dynamics**
- **Motion-Aware Structural Deformation Frameworks**
- **Canonical Space Parameterization and UV Mapping**
- **Layered and Disentangled Garment Representations**
- **Expressive Full-Body Avatar Reconstruction**

Complete Taxonomy Tree

- Dynamic Appearance Modeling of Loose Clothing in 3D Gaussian Avatars Survey Taxonomy
- Physics-Based Cloth Simulation and Dynamics
 - Inverse Physics with Fabric Parameter Estimation (1 papers)
 - [1] PhysAvatar: Learning the Physics of Dressed 3D Avatars from Visual Observations (Zheng Yang, 2024) [View paper](#)
 - Position-Based and Particle-Based Dynamics (2 papers)
 - [4] PBDyG: Position Based Dynamic Gaussians for Motion-Aware Clothed Human Avatars (Sasaki Shota, 2024) [View paper](#)
 - [11] MPMAvatar: Learning 3D Gaussian Avatars with Accurate and Robust Physics-Based Dynamics (Lee Chang-min, 2025) [View paper](#)
 - Simulation-Ready Garment Reconstruction (2 papers)
 - [5] PGC: Physics-Based Gaussian Cloth from a Single Pose (Michelle Guo, 2025) [View paper](#)
 - [9] SimAvatar: Simulation-Ready Avatars with Layered Hair and Clothing (Xueting Li, 2024) [View paper](#)
- Motion-Aware Structural Deformation Frameworks
 - Autoregressive and Graph-Based Deformation ★ (1 papers)
 - [0] Dynamic Texture Modeling of 3D Clothed Gaussian Avatars from a Single Video (Anon et al., 2026) [View paper](#)
 - Disentangled Motion and Appearance Modeling (2 papers)
 - [2] RealityAvatar: Towards Realistic Loose Clothing Modeling in Animatable 3D Gaussian Avatars (Li Yahui, 2025) [View paper](#)
 - [6] Topology-Aware Optimization of Gaussian Primitives for Human-Centric Volumetric Videos (Jiang Yuheng, 2025) [View paper](#)
- Canonical Space Parameterization and UV Mapping
 - UV-Space Displacement and Albedo Mapping (1 papers)
 - [14] Learning 3D Human UV with Loose Clothing from Monocular Video (Jingfan Guo, 2024) [View paper](#)
 - Parametric Template with CNN-Based Refinement (2 papers)
 - [8] Animatable and Relightable Gaussians for High-fidelity Human Avatar Modeling (Li Zhe, 2023) [View paper](#)
 - [12] Garment-aware gaussian for clothed human modeling from monocular video (Zhihao Yang, 2025) [View paper](#)
- Layered and Disentangled Garment Representations
 - Frozen Body with Separate Cloth Gaussians (1 papers)
 - [3] ClotheDreamer: Text-guided garment generation with 3D gaussians (Yufei Liu, 2024) [View paper](#)
 - Multi-Layer Controllable Primitives (1 papers)
 - [10] Drivable 3D Gaussian Avatars (Wojciech Zielonka, 2023) [View paper](#)

- Expressive Full-Body Avatar Reconstruction
 - Disentangled Expression and Motion Control (1 papers)
 - [7] EVA: Expressive Virtual Avatars from Multi-view Videos (Hendrik Junkawitsch, 2025) [View paper](#)
 - Monocular Video with Expressive Dynamics (2 papers)
 - [13] AViMO: 3D Avatar Reconstruction from Monocular Dance Videos with Expressive Motion (Daralnakhla, 2025) [View paper](#)
 - [15] PRADA3D: Photorealistic and Real-Time Animatable 3D Gaussian Avatar Reconstruction with Deformation Distillation and Dual Rectification (TC Chang, n.d.) [View paper](#)

Narrative

Core task: Dynamic appearance modeling of loose clothing in 3D Gaussian avatars. The field addresses the challenge of reconstructing and animating realistic human avatars with clothing that exhibits complex, motion-dependent deformations. The taxonomy reveals several complementary strategies: Physics-Based Cloth Simulation and Dynamics leverages physical constraints and material properties to drive garment motion (e.g., PhysAvatar[1], PBDyG[4]); Motion-Aware Structural Deformation Frameworks learn data-driven mappings between body pose and garment shape, often using graph or autoregressive architectures; Canonical Space Parameterization and UV Mapping establishes stable texture coordinates for tracking appearance across frames (e.g., Learning UV Loose Clothing[14]); Layered and Disentangled Garment Representations separate body and clothing into distinct geometric or neural components (e.g., ClotheDreamer[3], Garment Aware Gaussian[12]); and Expressive Full-Body Avatar Reconstruction focuses on capturing fine-grained details and diverse body motions in holistic systems (e.g., RealityAvatar[2], EVA[7]).

A central tension runs between physics-driven and learning-based approaches: physics simulators offer interpretability and generalization to unseen motions but can be computationally expensive, while neural deformation models achieve real-time performance yet may struggle with extreme poses. Within Motion-Aware Structural Deformation Frameworks, Dynamic Texture Clothed Gaussian[0] emphasizes autoregressive and graph-based deformation to capture temporal dependencies in loose garments, positioning itself alongside works like PGC[5] and Topology Aware Gaussian[6] that also exploit mesh connectivity for coherent shape updates. Compared to purely canonical-space methods such as Learning UV Loose Clothing[14], Dynamic Texture Clothed Gaussian[0] integrates motion history more explicitly, while differing from physics-heavy pipelines like PhysAvatar[1] by prioritizing learned priors over explicit simulation. Open questions remain around balancing physical plausibility with rendering speed, handling topology changes during extreme deformation, and generalizing learned models to novel garment types.

Related Works in Same Category

No sibling papers were found in the same taxonomy leaf. A taxonomy-subtopic-level comparison will be produced instead.

Taxonomy-Level Summary

Both subtopics address the challenge of modeling dynamic clothing deformation in 3D Gaussian avatars, but through fundamentally different architectural strategies. The autoregressive/graph-based approach emphasizes temporal prediction and structural connectivity through explicit graph representations, while the disentangled approach separates motion tracking from appearance rendering to handle complex non-rigid dynamics.

Similarities: - Both aim to model temporal dynamics of loose clothing in 3D Gaussian representations - Both address non-rigid deformation challenges beyond rigid body transformations - Both seek to improve realism in avatar clothing animation

Differences: - Autoregressive/graph-based methods use explicit temporal prediction models and graph structures to preserve spatial relationships, while disentangled methods separate motion and appearance into independent modules - Graph-based approaches emphasize structural connectivity between Gaussians, whereas disentangled methods focus on decoupling tracking from rendering - Autoregressive methods model dynamics through sequential prediction, while disentangled approaches handle topological changes through independent motion representations - The graph-based category explicitly requires temporal modeling and graph structures, while the disentangled category requires explicit separation of motion and appearance components

Suggested Search Directions: - Hybrid approaches combining graph structures with motion-appearance disentanglement - Comparative studies on temporal coherence between autoregressive prediction and disentangled tracking - Methods handling topological changes in graph-structured Gaussian representations

Sibling Subtopics

- **Disentangled Motion and Appearance Modeling** (leaves: 1, papers: 2)
 - Scope: Methods explicitly separating motion tracking from appearance representation to handle non-rigid dynamics and topological changes.
 - Exclude: Approaches with entangled motion-appearance representations or lacking explicit disentanglement belong elsewhere.

Contributions Analysis

Overall novelty summary. The paper proposes a motion-aware autoregressive structural deformation framework for modeling loose clothing in 3D Gaussian Splatting avatars. It occupies the 'Autoregressive and Graph-Based Deformation' leaf within the 'Motion-Aware Structural Deformation Frameworks' branch. Notably, this leaf contains only the original paper itself—no sibling papers are listed—indicating a relatively sparse research direction. The taxonomy shows 15 total papers across 11 leaf nodes, suggesting the field is moderately populated but with uneven distribution across approaches.

The taxonomy reveals neighboring directions that contextualize this work. The sibling leaf 'Disentangled Motion and Appearance Modeling' contains two papers (PGC, Topology Aware Gaussian) that also address non-rigid dynamics but emphasize explicit separation of motion tracking from appearance. Adjacent branches include 'Physics-Based Cloth Simulation' (three leaves, six papers total) focusing on simulation engines and material properties, and 'Canonical Space Parameterization' (two leaves, three papers) using UV-space representations. The paper's graph-structured autoregressive approach diverges from both physics-driven simulation and static canonical mappings, positioning it between learned temporal modeling and geometry-aware deformation.

Among 30 candidates examined, the contribution-level analysis shows varied novelty profiles. The core 'motion-aware autoregressive structural deformation framework' examined 10 candidates with zero refutable matches, suggesting limited direct prior work in this specific formulation. Similarly, the 'dynamic appearance modeling approach for loose clothing' found no refutations among 10 candidates. However, the 'in-the-wild dataset' contribution encountered one refutable candidate among 10 examined, indicating some overlap in dataset construction. The limited search scope (30 papers, not exhaustive) means these statistics reflect top-K semantic matches rather than comprehensive field coverage.

Based on the top-30 semantic search results, the work appears to occupy a relatively novel position within motion-aware deformation frameworks, particularly in combining autoregressive prediction with graph-structured Gaussians. The sparse population of its taxonomy leaf and low refutation rates across core contributions suggest incremental advancement over existing methods, though the analysis cannot rule out relevant work outside the examined candidate set. The dataset contribution shows more substantial prior overlap, consistent with established practices in avatar reconstruction benchmarks.

This paper presents **3 main contributions**, each analyzed against relevant prior work:

Contribution 1: Motion-aware autoregressive structural deformation framework for Gaussians

Description: The authors introduce a framework that structures 3D Gaussians into a graph and recursively predicts deformations to model realistic, template-free cloth dynamics. This approach addresses temporal context-unaware Gaussian deformation by incorporating motion awareness and autoregressive prediction.

This contribution was assessed against **10 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

1. Frequency-Guided Self-Supervised Wind-Driven Garment Animation Simulation

URL: [View paper](#)

Brief Assessment

Frequency Guided Garment Animation[31] focuses on wind-driven garment simulation using GNNs with frequency-domain wind encoding, not on 3D Gaussian avatar deformation with autoregressive temporal dynamics for human motion.

2. Predicting dynamic responses of continuous deformable bodies: A graph-based learning approach

URL: [View paper](#)

Brief Assessment

Graph Deformable Bodies[29] focuses on physics simulation of continuous deformable bodies using graph-based learning for general materials, not specifically on 3D Gaussian Splatting avatars or cloth dynamics in neural rendering contexts.

3. Human-Robot Deformation Manipulation Skill Transfer: Sequential Fabric Unfolding Method For Robots

URL: [View paper](#)

Brief Assessment

Sequential Fabric Unfolding[34] addresses fabric manipulation using behavior cloning and learning from demonstration for robotic control, not autoregressive graph-based deformation prediction for dynamic cloth simulation in 3D rendering contexts.

4. Hood: Hierarchical graphs for generalized modelling of clothing dynamics

URL: [View paper](#)

Brief Assessment

Hood[26] focuses on graph-based cloth simulation using GNNs for mesh dynamics, not 3D Gaussian Splatting avatars. The candidate addresses garment mesh deformation through hierarchical graph message-passing, while the original paper structures Gaussians into graphs for avatar animation—fundamentally different representations and application domains.

5. Deep Imitation Learning of Sequential Fabric Smoothing From an Algorithmic Supervisor

URL: [View paper](#)

Brief Assessment

Deep Imitation Fabric Smoothing[35] focuses on fabric smoothing via imitation learning from an algorithmic supervisor, not on autoregressive graph-based deformation for dynamic cloth simulation in 3D Gaussian avatars.

6. Swinger: spectrum-inspired neural dynamic deformation for free-swinging garments

URL: [View paper](#)

Brief Assessment

Swingar[28] focuses on garment mesh deformation using graph attention networks and LSTM for cloth dynamics, not 3D Gaussian Splatting avatars. The technical domains and representations differ fundamentally.

7. Learning cloth folding tasks with refined flow based spatio-temporal graphs

URL: [View paper](#)

Brief Assessment

Flow Spatio Temporal Folding[32] focuses on cloth folding tasks using spatiotemporal graphs for robotic manipulation, not on 3D Gaussian deformation for avatar animation. The candidate addresses a completely different application domain (robotic cloth manipulation vs. human avatar modeling) with different technical objectives.

8. VisuoSpatial Foresight for Physical Sequential Fabric Manipulation

URL: [View paper](#)

Brief Assessment

VisuoSpatial Foresight[33] focuses on fabric manipulation using visual dynamics models for planning pick-and-pull actions, not on autoregressive graph-based deformation prediction for dynamic cloth simulation with 3D Gaussians.

9. Ssfold: Learning to fold arbitrary crumpled cloth using graph dynamics from human demonstration

URL: [View paper](#)

Brief Assessment

Ssfold[27] focuses on cloth manipulation using graph dynamics from human demonstrations for robotic folding tasks, not on 3D Gaussian avatar deformation or neural rendering for human animation.

10. Efficient Deformation Learning of Varied Garments with a Structure-Preserving Multilevel Framework

URL: [View paper](#)

Brief Assessment

Structure Preserving Garment Deformation[30] focuses on garment mesh deformation using graph-based learning for clothing on arbitrary meshes, not on 3D Gaussian primitives for avatar animation. The technical domains and representations differ fundamentally.

Contribution 2: Dynamic appearance modeling approach for loose clothing in 3DGS-based avatars

Description: The authors present a new method specifically designed to handle dynamic appearances in loose garments for 3D Gaussian Splatting avatars. This addresses limitations in existing methods that struggle with realistic cloth motion and needle artifacts in loose clothing.

This contribution was assessed against **10 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

1. Learning disentangled avatars with hybrid 3d representations

URL: [View paper](#)

Brief Assessment

Disentangled Hybrid Avatars[38] focuses on disentangling body and clothing using hybrid mesh-nerf representations from monocular video, but does not specifically address dynamic appearance modeling for loose garments in 3DGS-based avatars or the temporal motion-aware deformation challenges that the original paper tackles.

2. Smartphone three-dimensional imaging for body composition assessment using non-rigid avatar reconstruction

URL: [View paper](#)

Brief Assessment

Smartphone Avatar Body Composition[42] focuses on body composition assessment using smartphone 3D scanning with non-rigid avatar reconstruction for anthropometric measurements, not on dynamic appearance modeling or cloth motion in 3DGS-based avatars.

3. Relightable full-body gaussian codec avatars

URL: [View paper](#)

Brief Assessment

Relightable Gaussian Codec[37] focuses on relighting and light transport modeling for full-body avatars under illumination changes, not on dynamic cloth motion or loose garment deformation that the original paper addresses.

4. DLCA-recon: dynamic loose clothing avatar reconstruction from monocular videos

URL: [View paper](#)

Brief Assessment

DLCA-recon[36] focuses on monocular video reconstruction using SDF-based implicit representations with dynamic deformation fields for loose clothing, not 3D Gaussian Splatting (3DGS). The technical approaches are fundamentally different.

5. Neural Garment Dynamic Super-Resolution

URL: [View paper](#)

Brief Assessment

Neural Garment Super Resolution[45] focuses on enhancing low-resolution garment simulations to high-resolution geometry with wrinkle details, not on dynamic appearance modeling for 3D Gaussian Splatting avatars or addressing needle artifacts in loose clothing animation.

6. A cross-period network for clothing change person re-identification

URL: [View paper](#)

Brief Assessment

Clothing Change ReID[41] addresses person re-identification across cameras with changing clothing features, not dynamic appearance modeling of loose garments in 3D Gaussian Splatting avatars. The candidate focuses on matching pedestrians despite clothing changes, while the original models realistic cloth motion and dynamics in 3D avatar rendering.

7. Modeling Dynamic Clothing for Data-Driven Photorealistic Avatars

URL: [View paper](#)

Brief Assessment

Dynamic Clothing Photorealistic[44] focuses on physics-based cloth simulation combined with neural rendering for loose clothing in avatars, but does not use 3D Gaussian Splatting (3DGS) as the underlying representation. The original paper's contribution is specifically about dynamic appearance modeling within the 3DGS framework, which is a distinct technical approach.

8. GaussianAvatar: Towards Realistic Human Avatar Modeling from a Single Video via Animatable 3D Gaussians

URL: [View paper](#)

Brief Assessment

GaussianAvatar[39] focuses on general animatable 3D Gaussian avatars from single videos but does not specifically address the dynamic appearance modeling challenges for loose clothing that the original paper targets, such as temporal context-aware deformation and cloth shape-agnostic initialization.

9. Hdhumans: A hybrid approach for high-fidelity digital humans

URL: [View paper](#)

Brief Assessment

HDHumans[43] uses NeRF-based rendering with classical surface deformation templates, not 3D Gaussian Splatting. The candidate focuses on high-resolution synthesis and surface reconstruction rather than addressing dynamic cloth motion artifacts specific to 3DGS representations.

10. Structured Local Radiance Fields for Human Avatar Modeling

URL: [View paper](#)

Brief Assessment

Structured Local Radiance[40] uses structured local radiance fields with NeRF-based representations, not 3D Gaussian Splatting. The technical approach and underlying representation are fundamentally different from the original paper's 3DGS-based method.

Contribution 3: In-the-wild dataset with subjects in loose clothing performing dynamic movements

Description: The authors contribute a new dataset containing subjects wearing loose clothing and performing dynamic movements. This dataset enables evaluation of methods for modeling secondary motion and dynamic appearances in challenging real-world scenarios.

This contribution was assessed against **10 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

1. Deep fashion3d: A dataset and benchmark for 3d garment reconstruction from single images

URL: [View paper](#)

Brief Assessment

Deep Fashion3D[21] focuses on static 3D garment reconstruction from single images, not dynamic motion capture. The dataset contains garments 'randomly posed on a dummy model or real human' but does not capture subjects performing dynamic movements or secondary motion as emphasized in the original paper.

2. Flat'n'Fold: A Diverse Multi-Modal Dataset for Garment Perception and Manipulation

URL: [View paper](#)

Brief Assessment

Flat'n'Fold[20] focuses on garment manipulation (flattening and folding) with RGB-D data and action annotations, not on motion capture of clothed humans performing dynamic movements for avatar modeling.

3. 4DHumanOutfit: a multi-subject 4D dataset of human motion sequences in varying outfits exhibiting large displacements

URL: [View paper](#)

Brief Assessment

4DHumanOutfit[23] focuses on multi-view studio capture with different actors, outfits, and motions in a controlled setting, while the original paper emphasizes in-the-wild single-video capture with loose garments and secondary motion dynamics. The datasets serve different purposes and capture conditions.

4. BEDLAM: A Synthetic Dataset of Bodies Exhibiting Detailed Lifelike Animated Motion

URL: [View paper](#)

Brief Assessment

[Final Audit Failure] The model insisted on a refutation claim but failed to provide verifiable evidence after multiple retries. Marked as cannot_refute for safety. Please manually verify the candidate text.

5. Video classification of cloth simulations: Deep learning and position-based dynamics for stiffness prediction

URL: [View paper](#)

Brief Assessment

Cloth Simulation Classification[18] focuses on virtual cloth simulation and stiffness prediction from videos, not on creating datasets for human motion capture with loose clothing. The candidate's dataset consists of simulated cloth movements for material property extraction, whereas the original paper presents real-world human subjects performing dynamic movements.

6. Inertial measurement data from loose clothing worn on the lower body during everyday activities

URL: [View paper](#)

Brief Assessment

Inertial Loose Clothing[25] focuses on IMU sensor data from loose clothing for activity monitoring and posture classification, not on visual motion capture or 3D reconstruction of cloth dynamics for avatar modeling.

7. 4D-DRESS: A 4D Dataset of Real-World Human Clothing with Semantic Annotations

URL: [View paper](#)

Prior Art Analysis

4D-DRESS[17] demonstrates that a prior real-world dataset exists featuring subjects in loose clothing performing dynamic movements. The candidate paper explicitly describes capturing subjects wearing loose-fitting garments (dresses, jackets, coats) performing diverse dynamic motions in real-world scenarios. This directly challenges the novelty claim that the original paper is the first to contribute such a dataset, as 4D-DRESS[17] was designed specifically to capture challenging clothing dynamics and secondary motion in real-world conditions.

Evidence

Evidence 1 - **Rationale:** 4D-DRESS[17] provides a comprehensive real-world dataset with extensive motion sequences capturing dynamic clothing behavior, which directly overlaps with the original paper's claimed contribution of an in-the-wild dataset for evaluating dynamic appearance modeling. - **Original:** we introduce an in-the-wild dataset featuring subjects performing dynamic movements in loose clothing, and extensive experiments validate that our approach significantly outperforms existing 3dgs-based methods in modeling dynamic appearances from single videos. - **Candidate:** 4d-dress contains 520 motion sequences (150 frames at 30 fps) in 64 real-world human outfits with a total of 78k frames. Each frame consists of multi-view images at 1k resolution, an 80k-face triangle 3d mesh with vertex annotations, and a 1k-resolution texture map.

8. A comprehensive evaluation of marker-based, markerless methods for loose garment scenarios in varying camera configurations

URL: [View paper](#)

Brief Assessment

Marker Loose Garment Evaluation[19] focuses on benchmarking motion capture methods (marker-based vs. markerless) using simulated garments, not on creating a real-world dataset of subjects in loose clothing performing dynamic movements for avatar modeling.

9. Mocapose: Motion capturing with textile-integrated capacitive sensors in loose-fitting smart garments

URL: [View paper](#)

Brief Assessment

Mocapose[24] focuses on capacitive sensor-based motion capture for upper body tracking with textile integration, not on visual reconstruction or modeling of loose clothing dynamics from video data.

10. Rec-mv: Reconstructing 3d dynamic cloth from monocular videos

URL: [View paper](#)

Brief Assessment

Rec-mv[22] introduces a dataset for dynamic garment reconstruction from monocular video, but focuses on garment mesh extraction rather than general avatar modeling with secondary motion dynamics as in the original paper.

Appendix: Text Similarity Detection

No high-similarity text segments were detected across any compared papers.

References

- [0] Dynamic Texture Modeling of 3D Clothed Gaussian Avatars from a Single Video [View paper](#)
- [1] PhysAvatar: Learning the Physics of Dressed 3D Avatars from Visual Observations [View paper](#)
- [2] RealityAvatar: Towards Realistic Loose Clothing Modeling in Animatable 3D Gaussian Avatars [View paper](#)
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