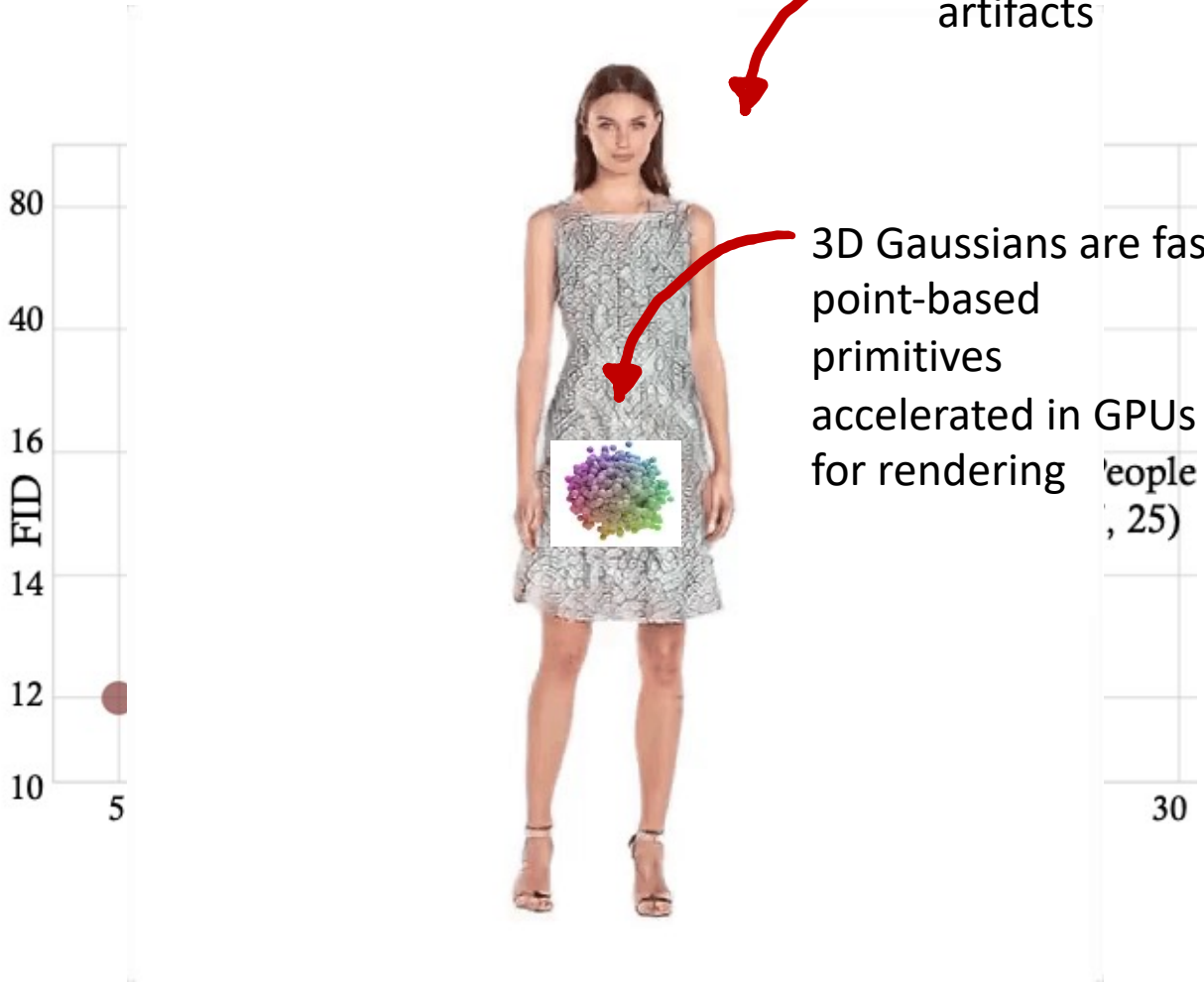
Gaussian Shell Maps for Efficient 3D Human Generation

[Rameen Abdal](#)[*1], [Wang Yifan](#)[*1], [Zifan Shi](#)[*2], [Yinghao Xu](#)[1], [Ryan Po](#)[1], [Zhengfei Kuang](#)[1], [Qifeng Chen](#)[2], [Dit-Yan Yeung](#)[2], [Gordon Wetzstein](#)[1]

[1]Stanford University, [2]HKUST

*Equal Contribution

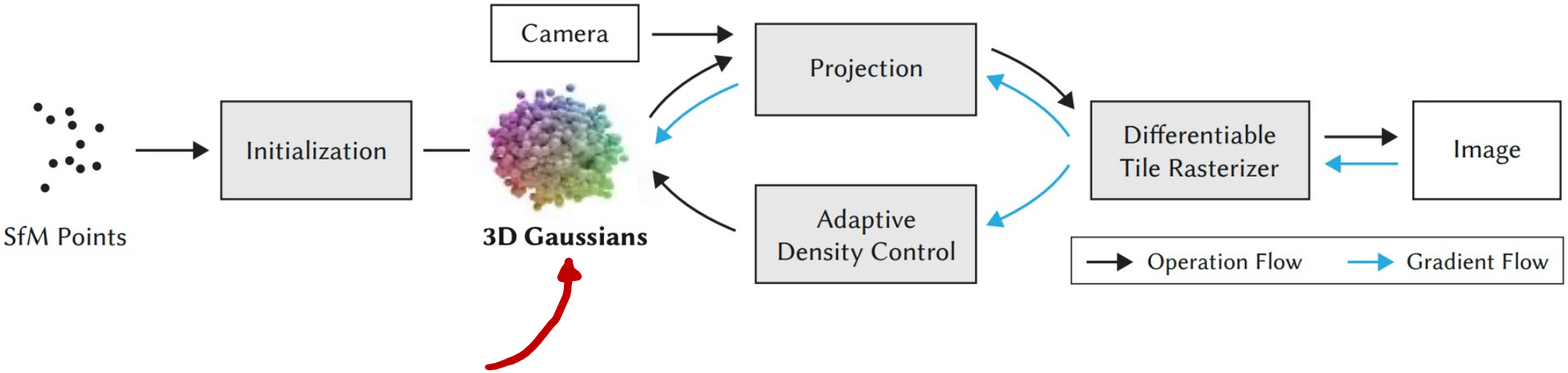
Trends in 3D Human Generation



Gaussian Shell Maps for Efficient 3D Human Generation

Rameen Abdal*, Wang Yifan*, Zifan Shi*, Yinghao Xu, Ryan Po, Zhengfei Kuang, Qifeng Chen, Dit-Yan Yeung, Gordon Wetzstein

3D Gaussians



Opacity

Scale

Rotation

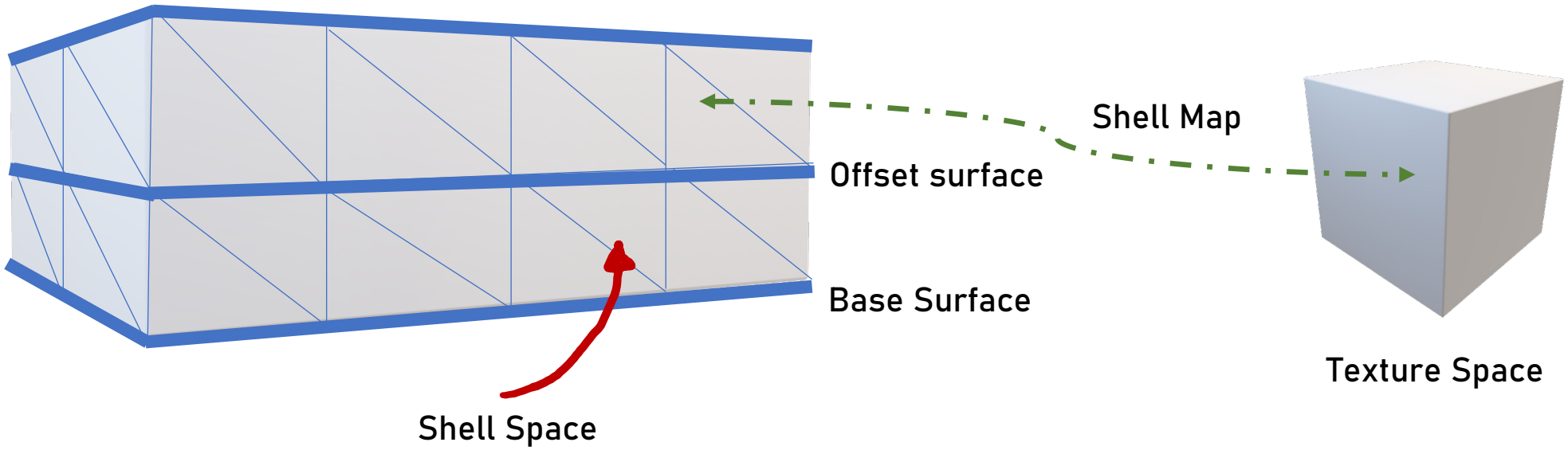
SH parameters

Positions

3D Gaussian Splatting for Real-Time Radiance Field Rendering

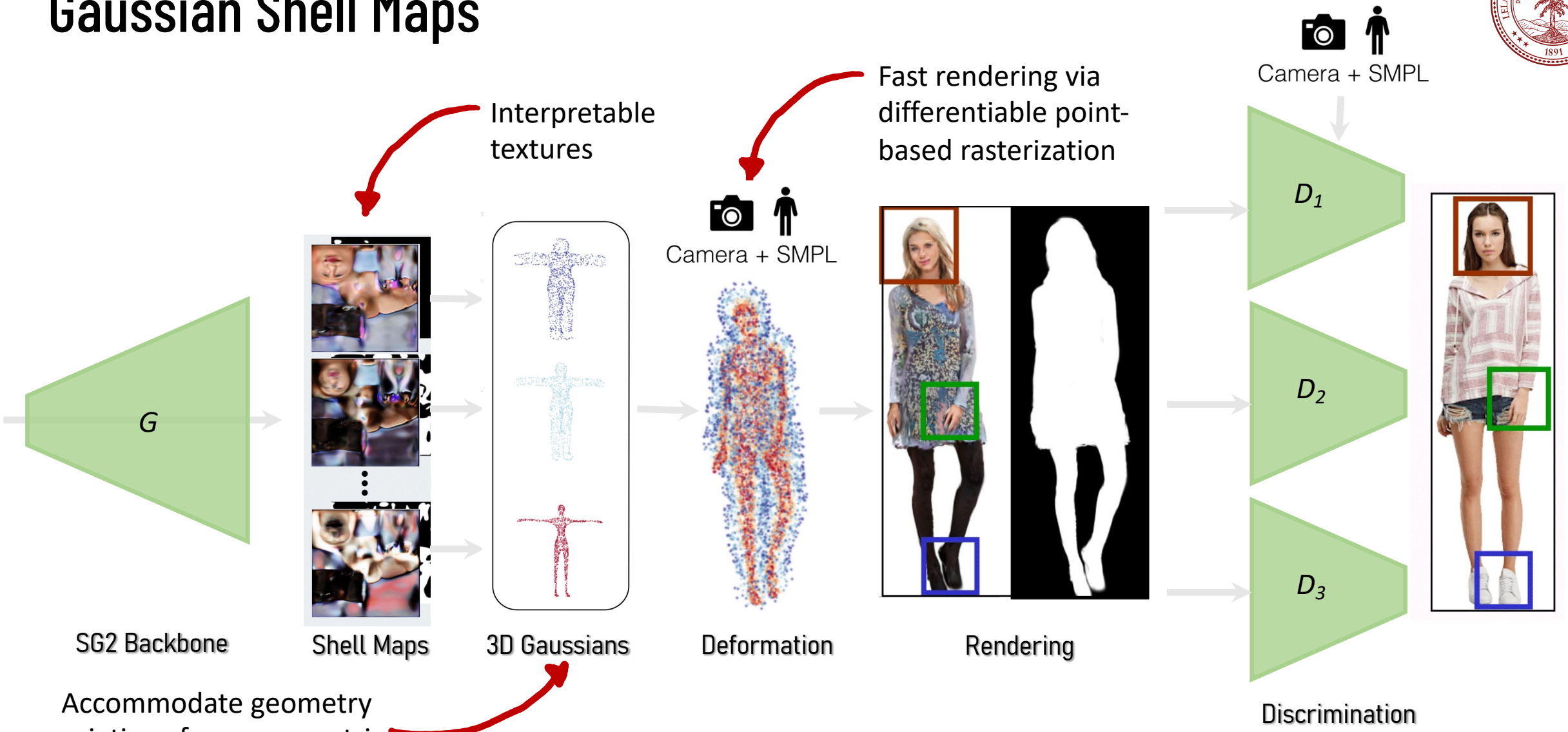
Kerbl, Bernhard and Kopanas, Georgios and Leimkuehler, Thomas and Drettakis, George

Shell Maps



3D Gaussian Splatting for Real-Time Radiance Field Rendering
Kerbl, Bernhard and Kopanas, Georgios and Leimkuehler, Thomas and Drettakis, George

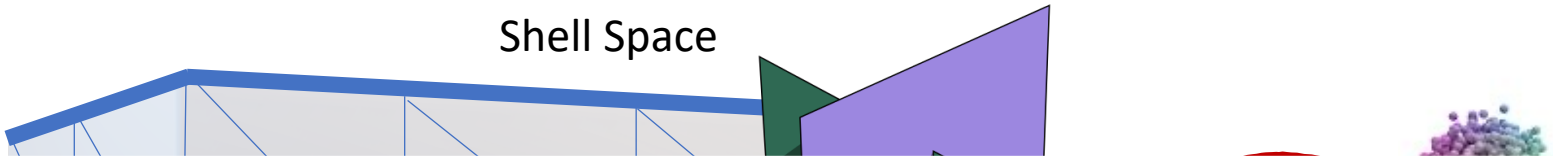
Gaussian Shell Maps



Gaussian Shell Maps for Efficient 3D Human Generation

Rameen Abdal*, Wang Yifan*, Zifan Shi*, Yinghao Xu, Ryan Po, Zhengfei Kuang, Qifeng Chen, Dit-Yan Yeung, Gordon Wetzstein

Rendering Alternatives



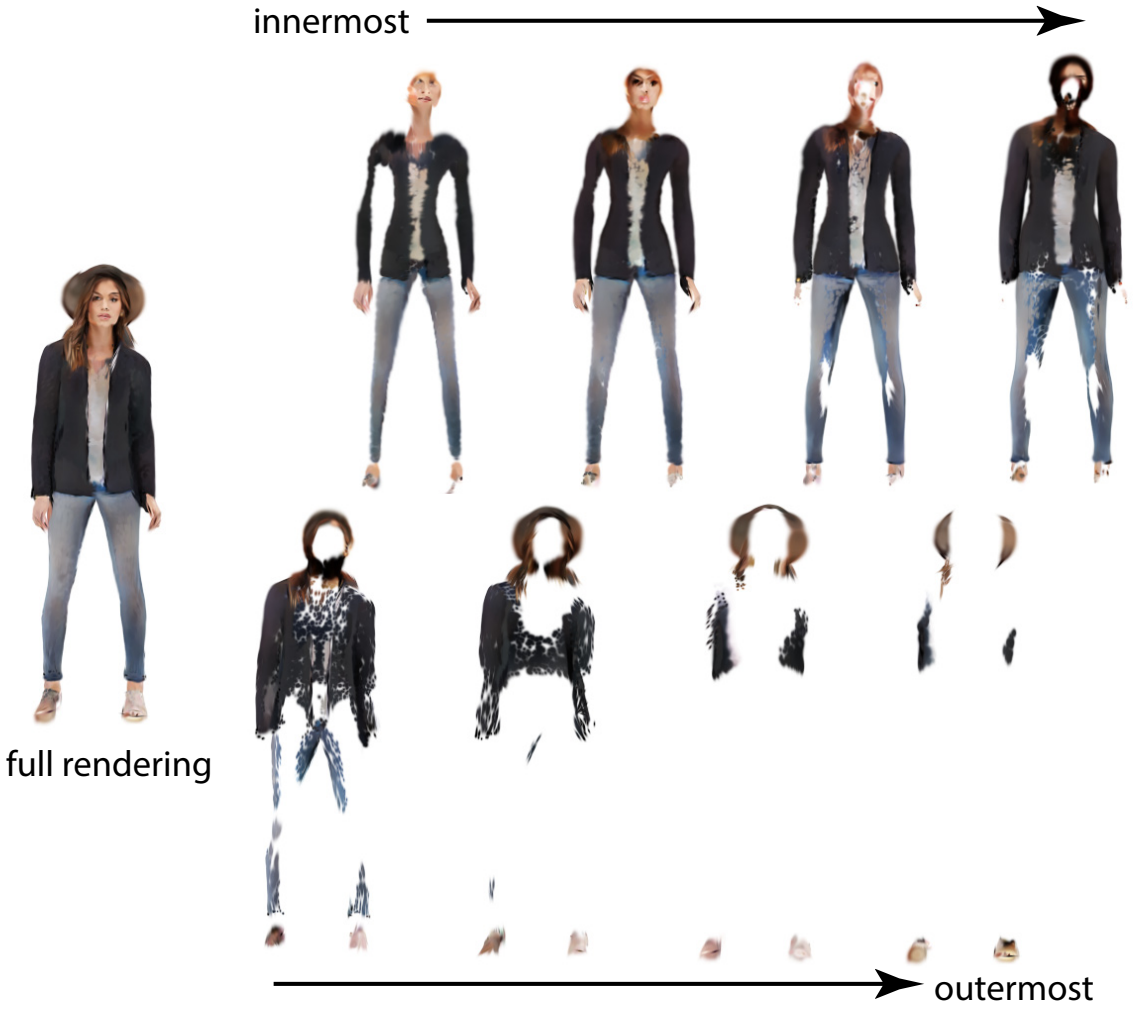
Anchoring Alternatives.

Anchoring	bbox	tets	learned offset	triangles (proposed)
FID ↓	63.90	24.66	29.30	**20.63**

Gaussian Shell Maps for Efficient 3D Human Generation

Rameen Abdal*, Wang Yifan*, Zifan Shi*, Yinghao Xu, Ryan Po, Zhengfei Kuang, Qifeng Chen, Dit-Yan Yeung, Gordon Wetzstein

Shells Visualization



Gaussian Shell Maps for Efficient 3D Human Generation

Rameen Abdal*, Wang Yifan*, Zifan Shi*, Yinghao Xu, Ryan Po, Zhengfei Kuang, Qifeng Chen, Dit-Yan Yeung, Gordon Wetzstein

Results Overview

3D Gaussians




Generation and Animation




Interpolation | Walking Sequence | Jumping Sequence | Swing Sequence

Pose Variations

Editing

Original

Lower body

Upper body

Interpolations

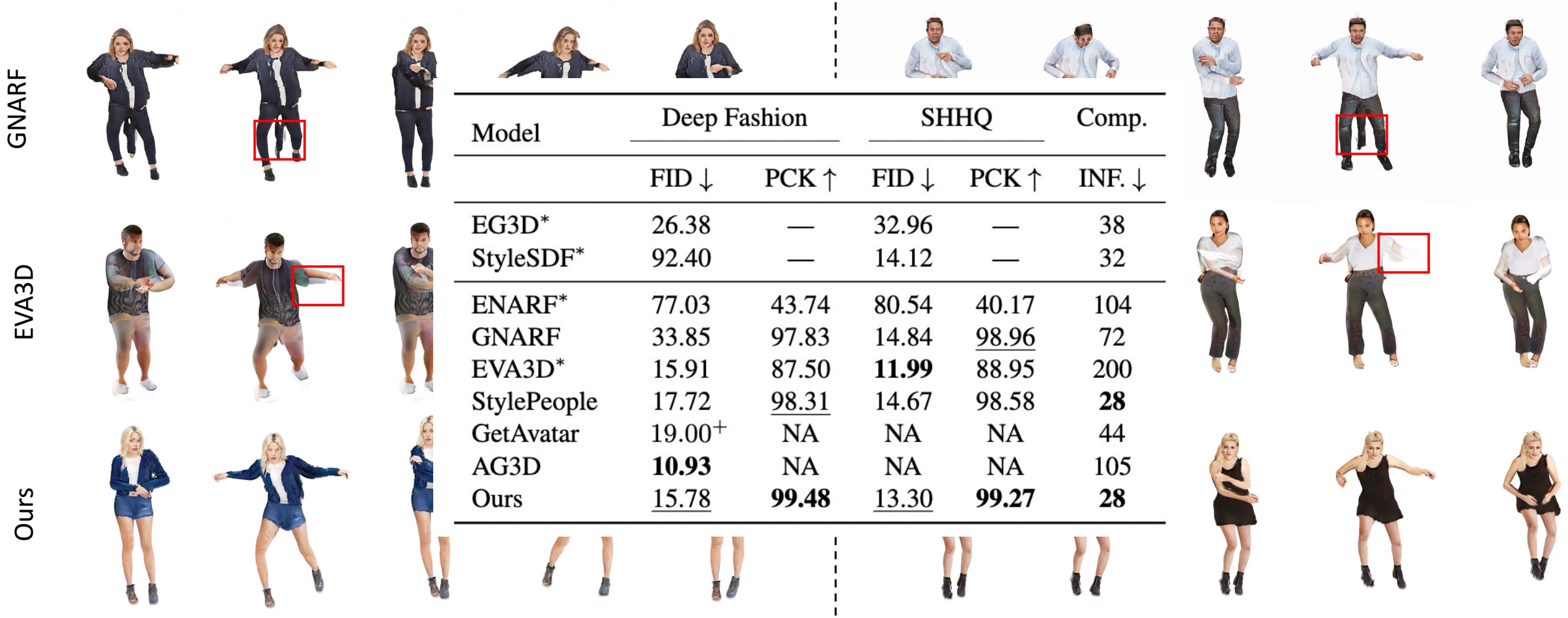
Animations

Comparison to SOTA

Ours
35 FPS

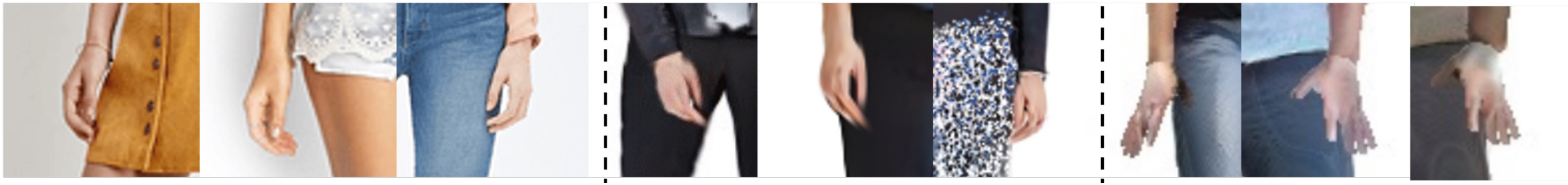
AG3D
10 FPS

Comparison to SOTA

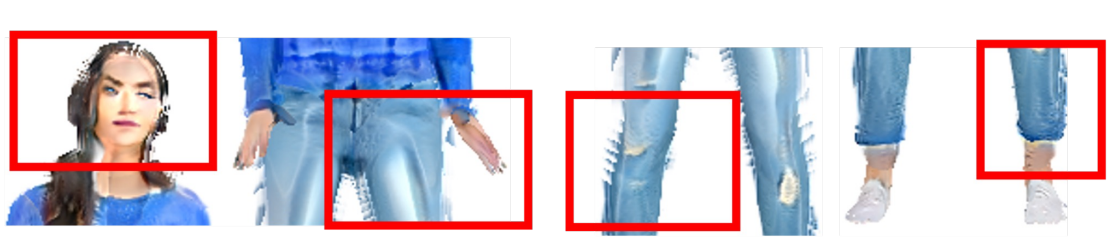


Model	Deep Fashion		SHHQ		Comp.
	FID ↓	PCK ↑	FID ↓	PCK ↑	INF. ↓
EG3D*	26.38	—	32.96	—	38
StyleSDF*	92.40	—	14.12	—	32
ENARF*	77.03	43.74	80.54	40.17	104
GNARF	33.85	97.83	14.84	<u>98.96</u>	72
EVA3D*	15.91	87.50	**11.99**	88.95	200
StylePeople	17.72	<u>98.31</u>	14.67	98.58	**28**
GetAvatar	19.00+	NA	NA	NA	44
AG3D	**10.93**	NA	NA	NA	105
Ours	<u>15.78</u>	**99.48**	<u>13.30</u>	**99.27**	**28**

Comparison to SOTA



Reference Images | Ours | LSV-GAN



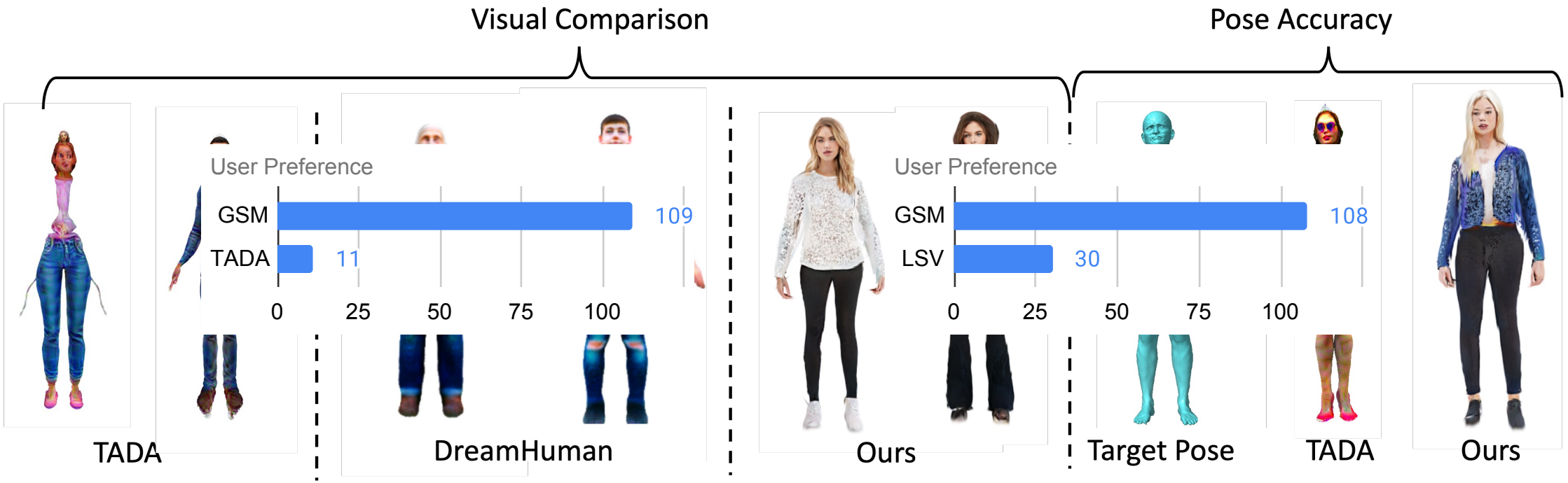
LSV-GAN

Ours

Gaussian Shell Maps for Efficient 3D Human Generation

Rameen Abdal*, Wang Yifan*, Zifan Shi*, Yinghao Xu, Ryan Po, Zhengfei Kuang, Qifeng Chen, Dit-Yan Yeung, Gordon Wetzstein

Comparison to SOTA



Gaussian Shell Maps for Efficient 3D Human Generation

Rameen Abdal*, Wang Yifan*, Zifan Shi*, Yinghao Xu, Ryan Po, Zhengfei Kuang, Qifeng Chen, Dit-Yan Yeung, Gordon Wetzstein

Conclusion

A novel 3D GAN framework ***combining a CNN-based generator and 3D Gaussian rendering*** primitives using shell maps.

Fastest 3D GAN architecture to date, achieving real-time rendering of ***512x512 px without convolutional upsamplers***.

Highly diverse appearances, including loose clothing and accessories, at ***a state-of-the-art rendering speed of 125 FPS (or 35FPS including generation***).

Project Page

Gaussian Shell Maps for Efficient 3D Human Generation

Rameen Abdal*, Wang Yifan*, Zifan Shi*, Yinghao Xu, Ryan Po, Zhengfei Kuang, Qifeng Chen, Dit-Yan Yeung, Gordon Wetzstein

Gaussian Shell Maps for Efficient 3D Human Generation

[Rameen Abdal](#)[*1], [Wang Yifan](#)[*1], [Zifan Shi](#)[*2], [Yinghao Xu](#)[1], [Ryan Po](#)[1], [Zhengfei Kuang](#)[1], [Qifeng Chen](#)[2], [Dit-Yan Yeung](#)[2], [Gordon Wetzstein](#)[1]

[1]Stanford University, [2]HKUST

*Equal Contribution