

Heat Kernel Textures: the Geodesic Gaussians That Do Not Splat

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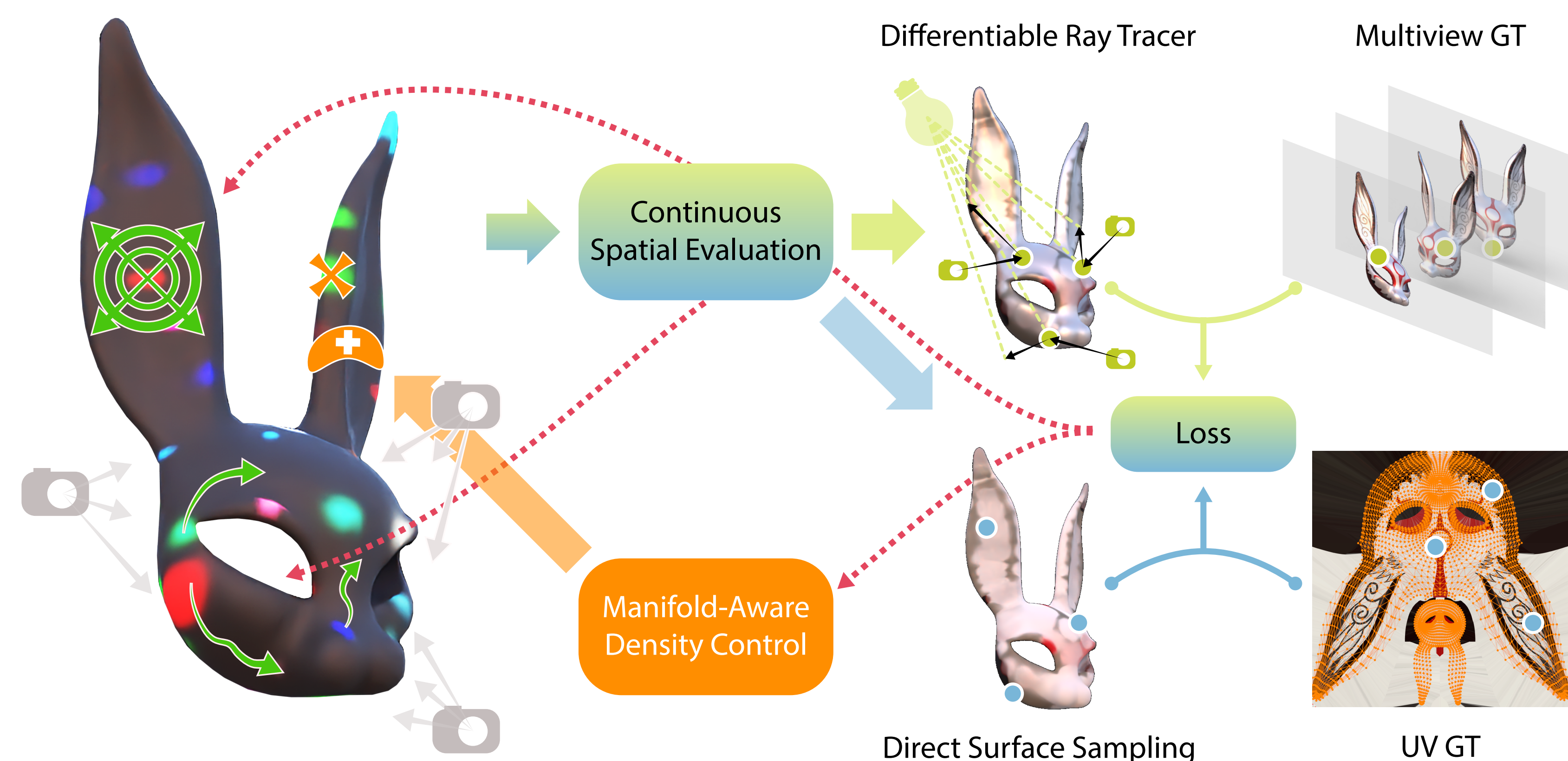
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Tolga Birdal

UV-Textures: seams, distortions, wasted space, varying resolution, need to store UV coordinates.

HKTex: inspired by Gaussian Splatting, with Heat Kernels as Geodesic Gaussians.

Continuous evaluation.
Kernels are always on surface with RGD.
Manifold-aware shape and density controls.
Physically based rendered.
None of the UV issues.



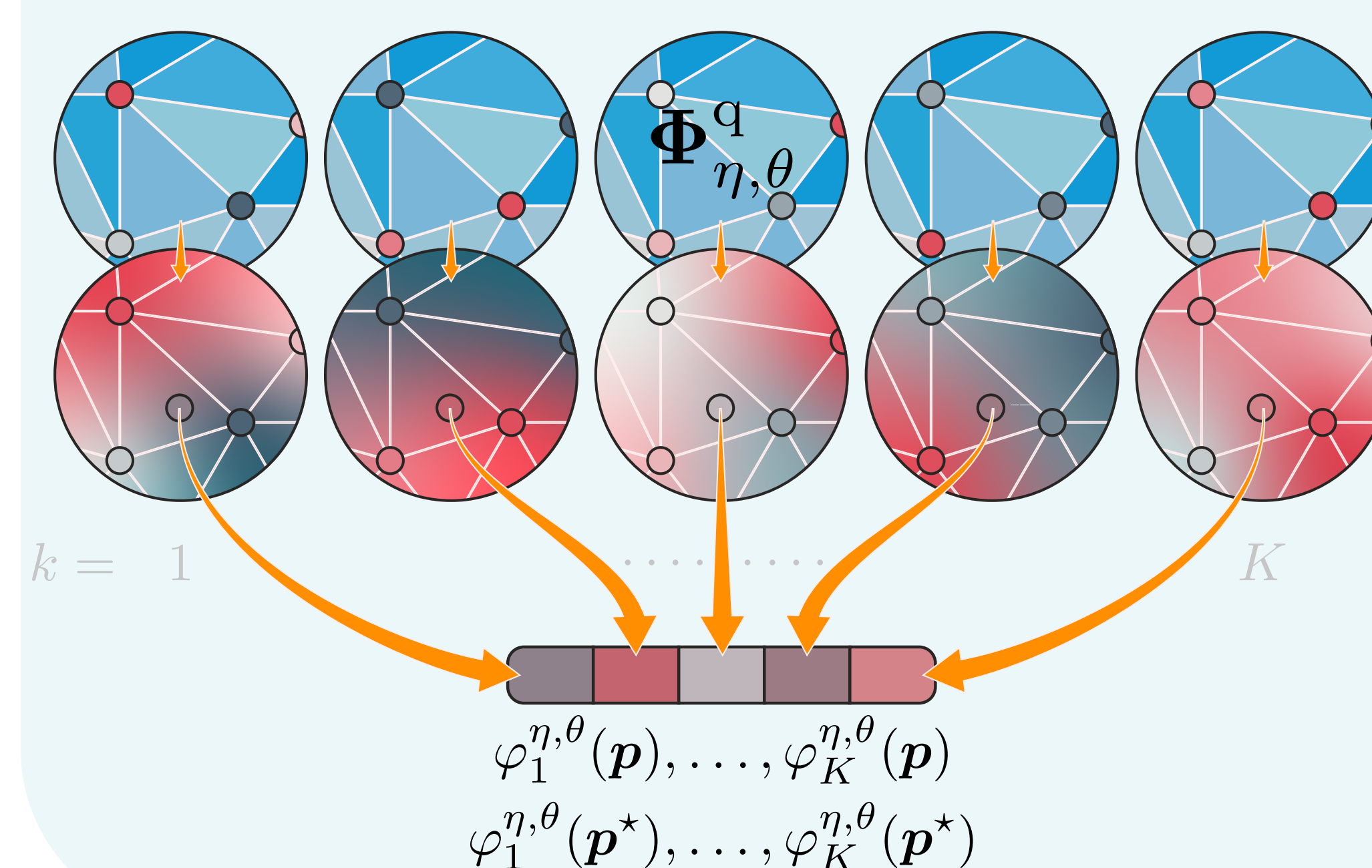
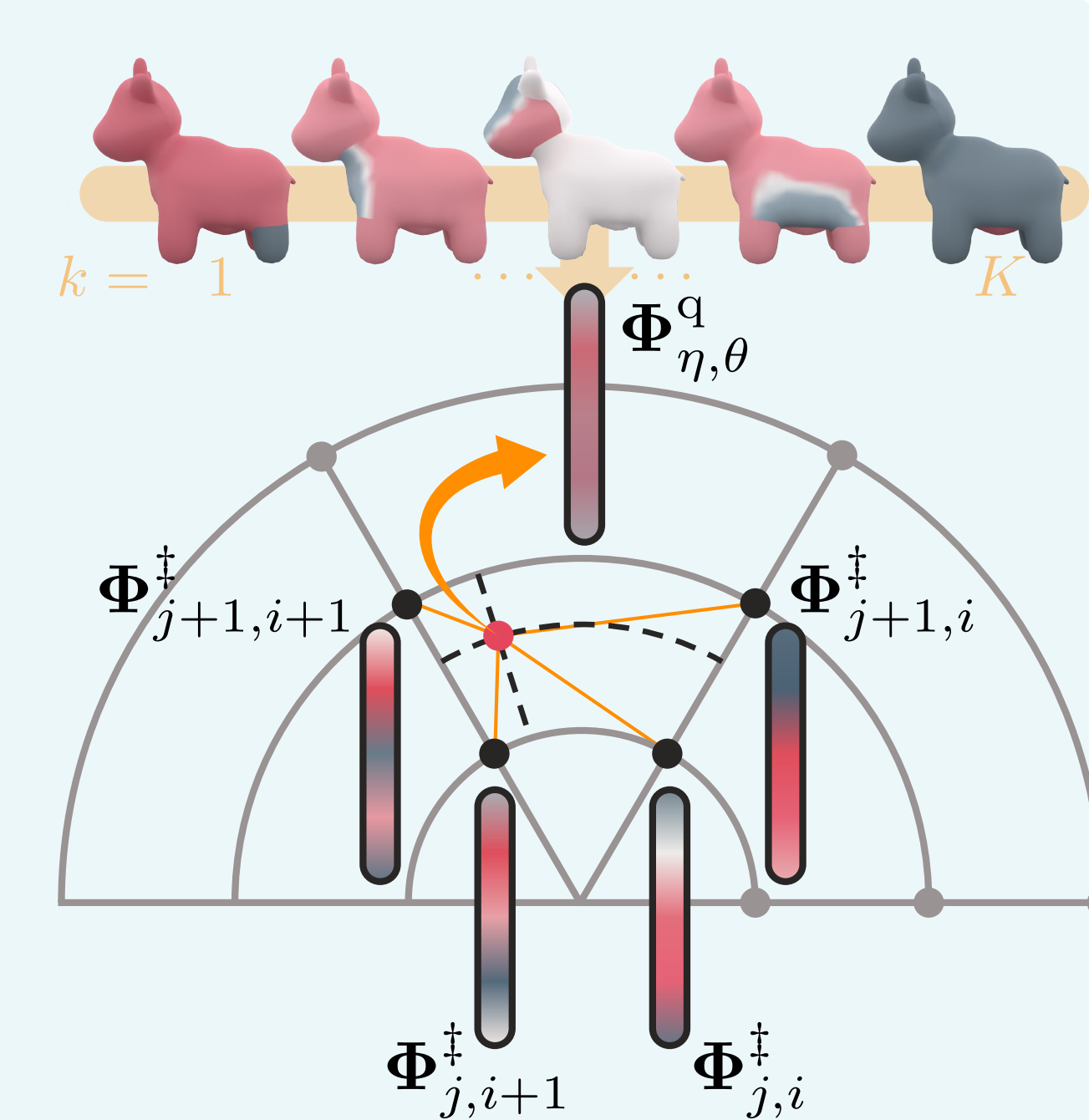
ALBO Eigenproperties

Interpolation

Precompute & align eigenproperties (permute, rotate, flip-sign)

Query eigenproperties for new η, θ :

- find bounding grid corners
- interpolate their eigenproperties



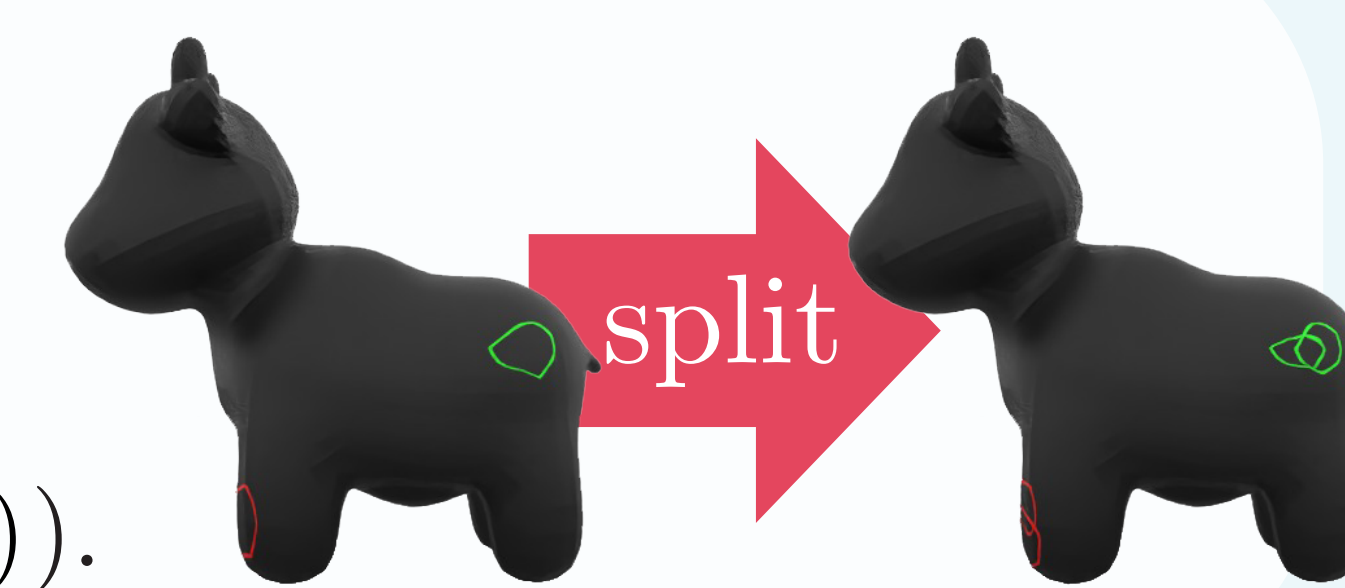
Local Evaluation

- Eigenproperties change smoothly
- Barycentrically interpolate them within triangles

Manifold Aware Density Control

Prune: rarely hit or low energy (aggregated $\alpha_s(\mathbf{p})$) kernels.

Densify: duplicate/split high error kernels (redistributed according to $C(\mathbf{p})$).



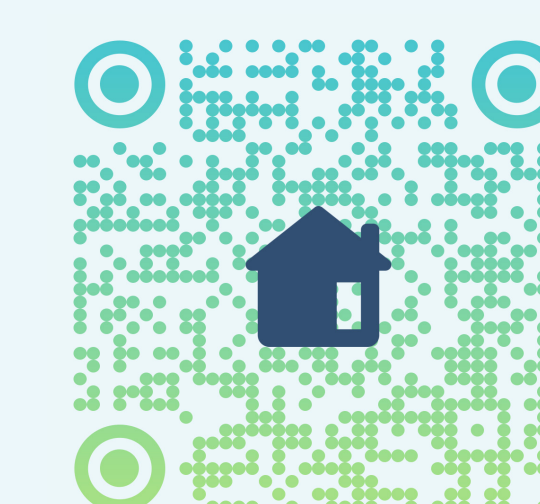
Optimisation

Kernel Shape and Colour

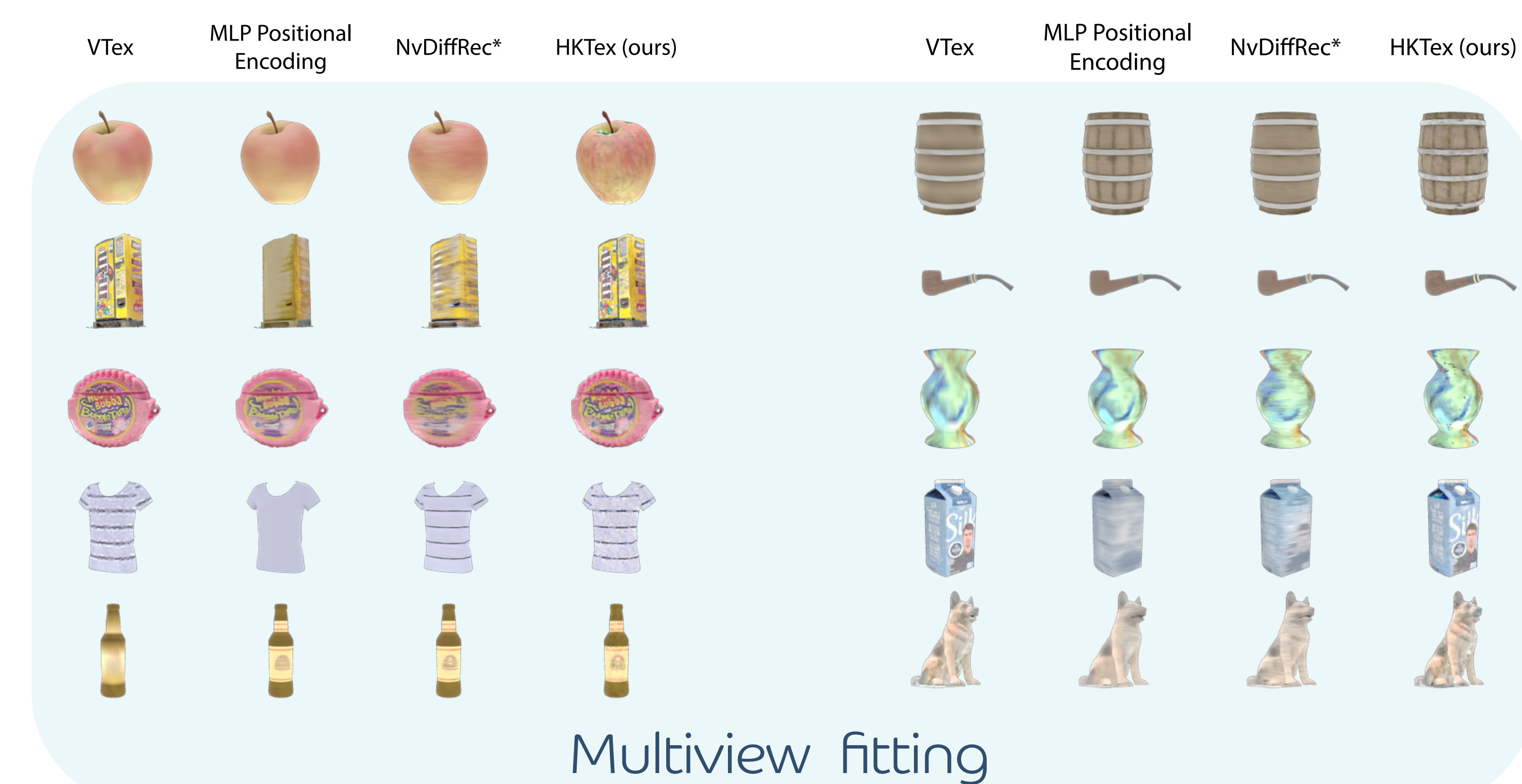
Traditional Euclidean Optimisation (ADAM)

Kernel Position

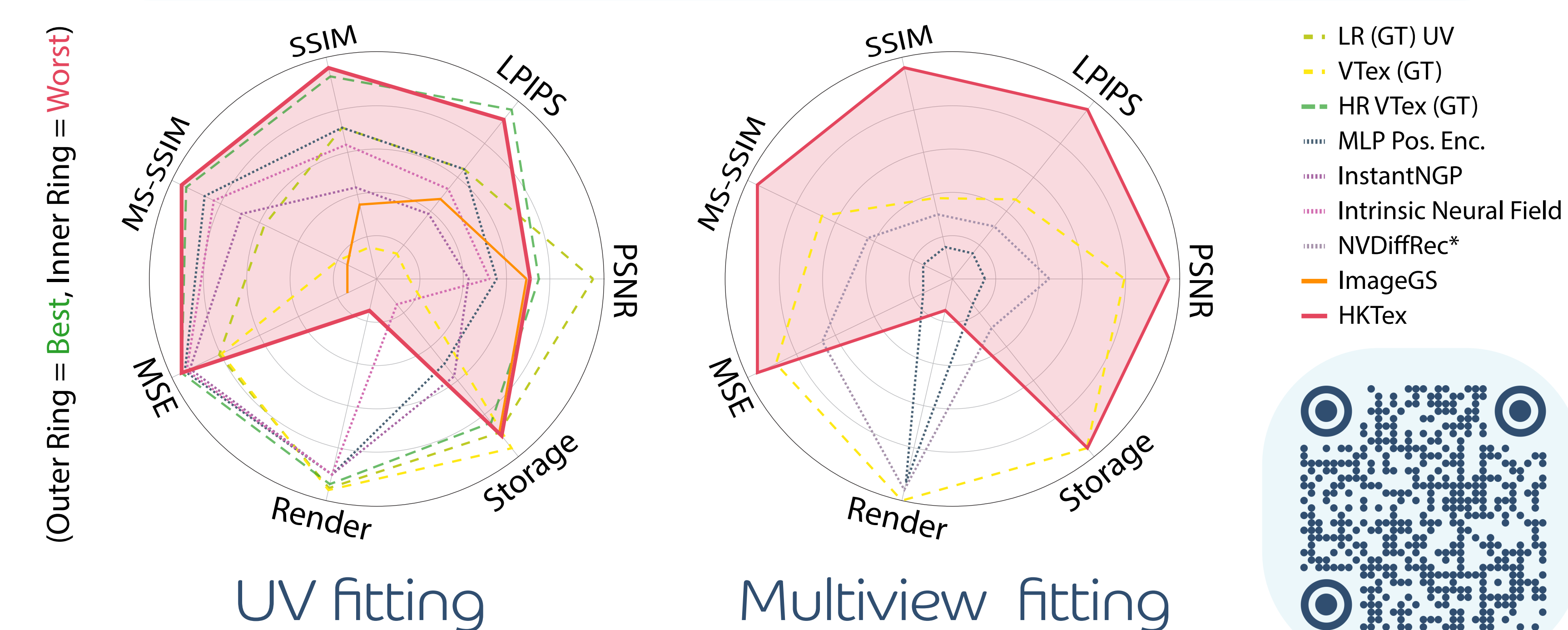
Riemannian Optimisation (RGD with momentum)



UV fitting



Multiview fitting



UV fitting

Multiview fitting