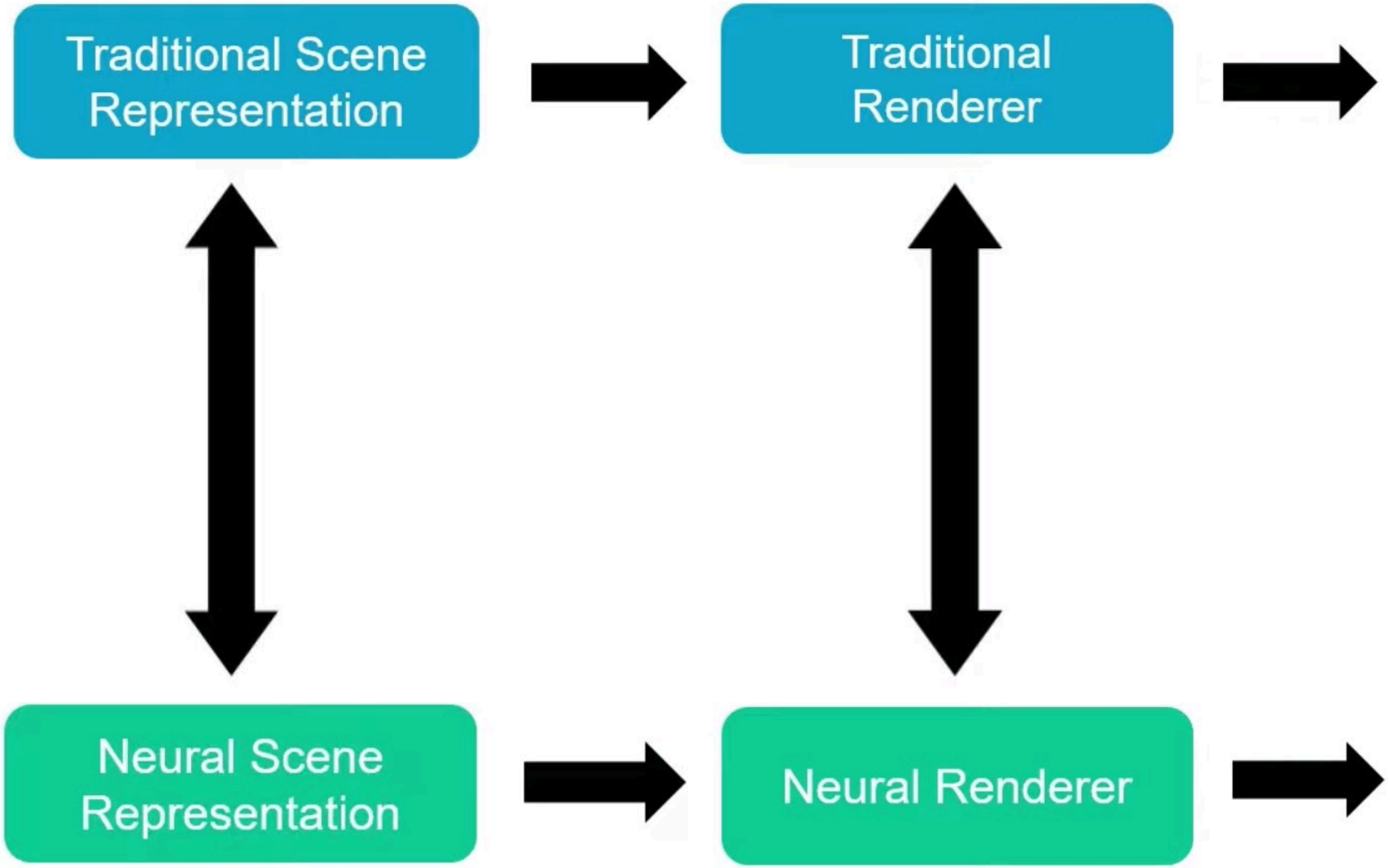
Neural Scene Graph Rendering

Jonathan Granskog et al., presented at SIGGRAPH 2021

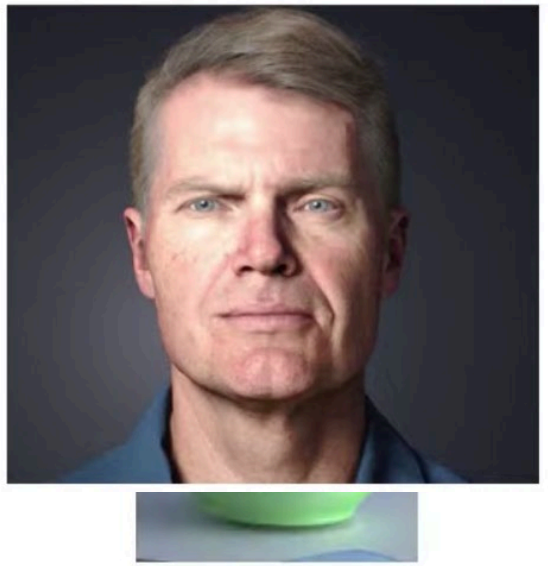
NVIDIA

Credit to CS348i Journalist Slides

The Goal

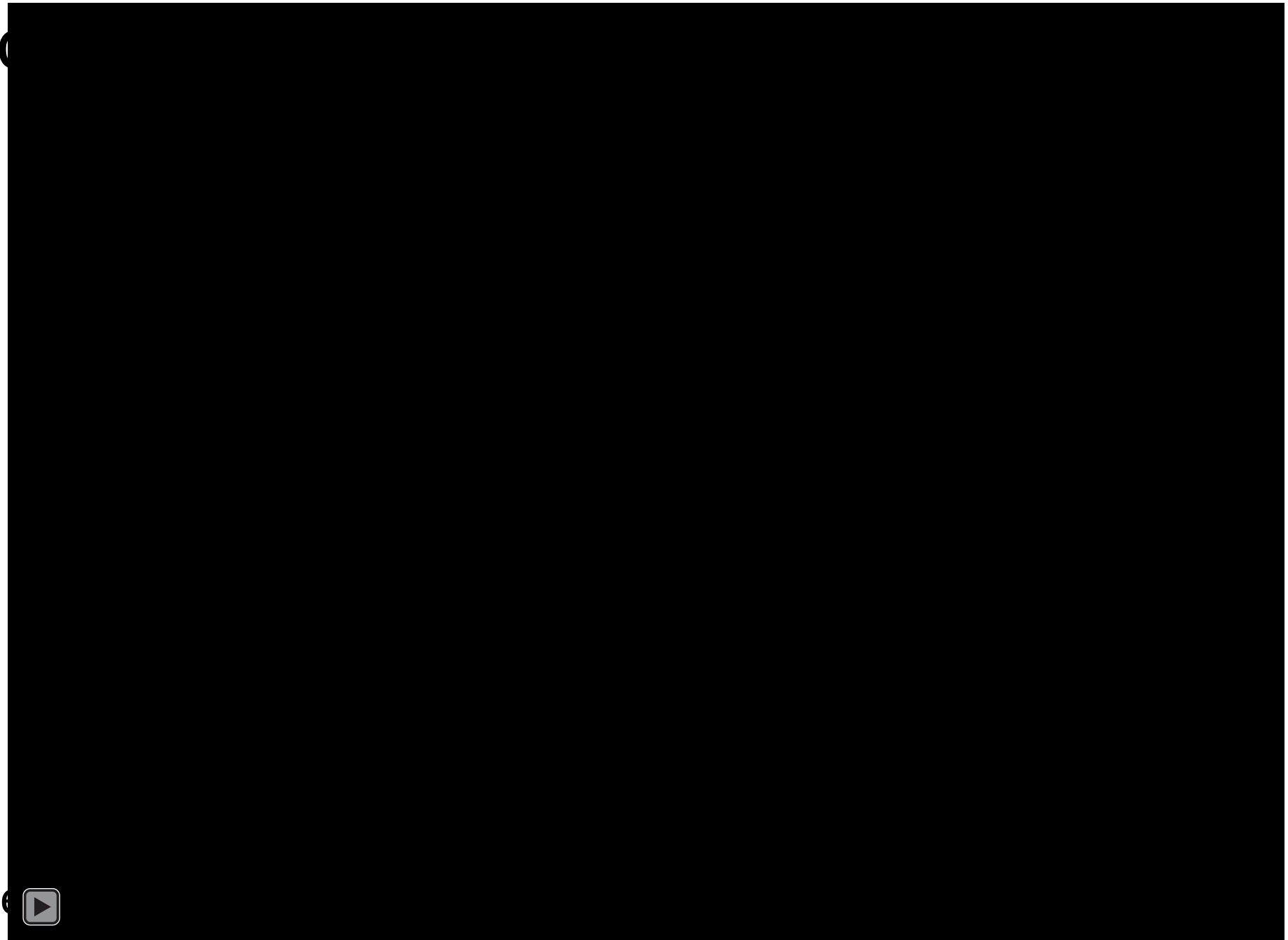


MEETMIKE, SIGGRAPH 2017



Karras et al., 2019

The Ge



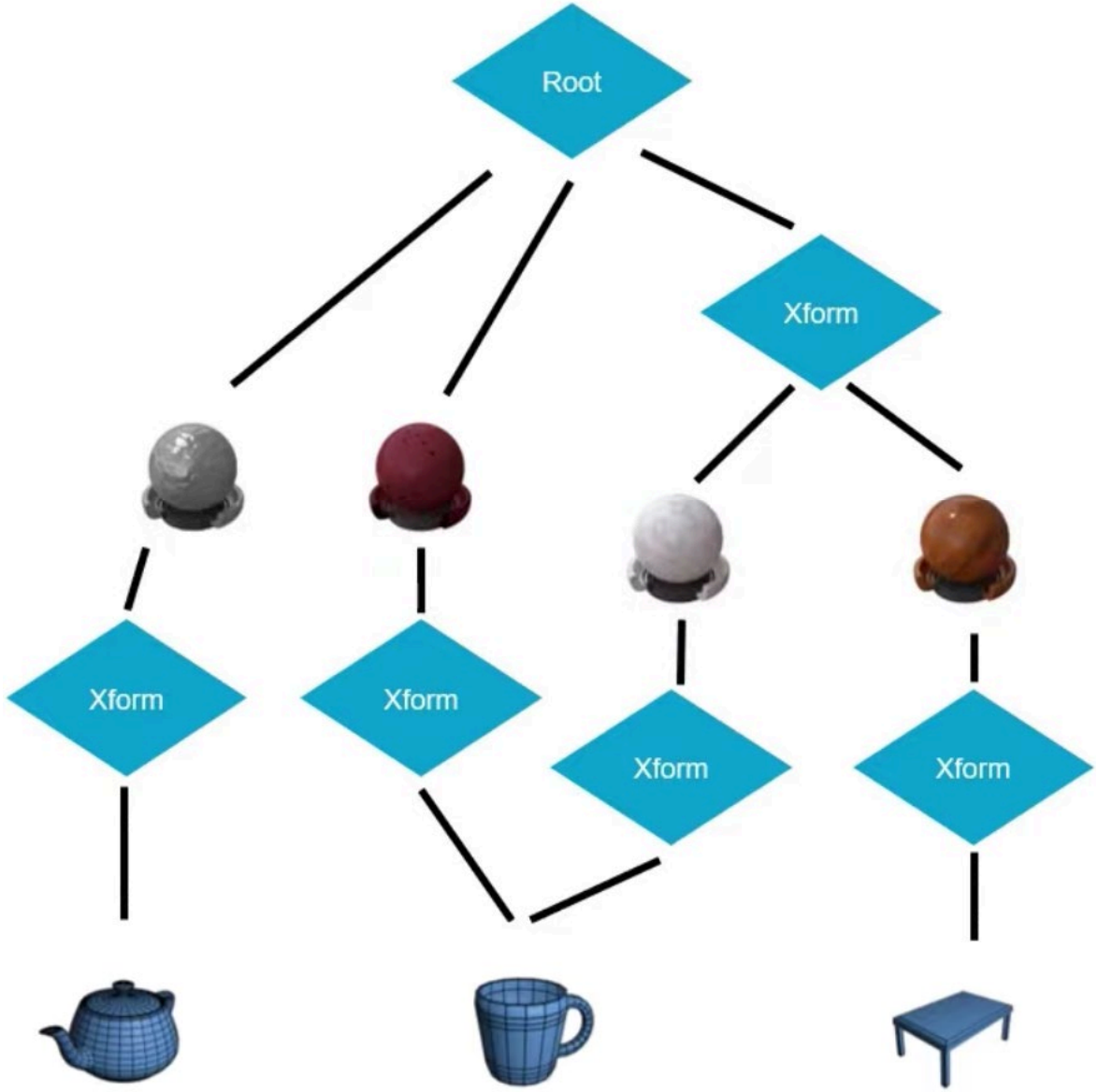
Re

The Key Parts

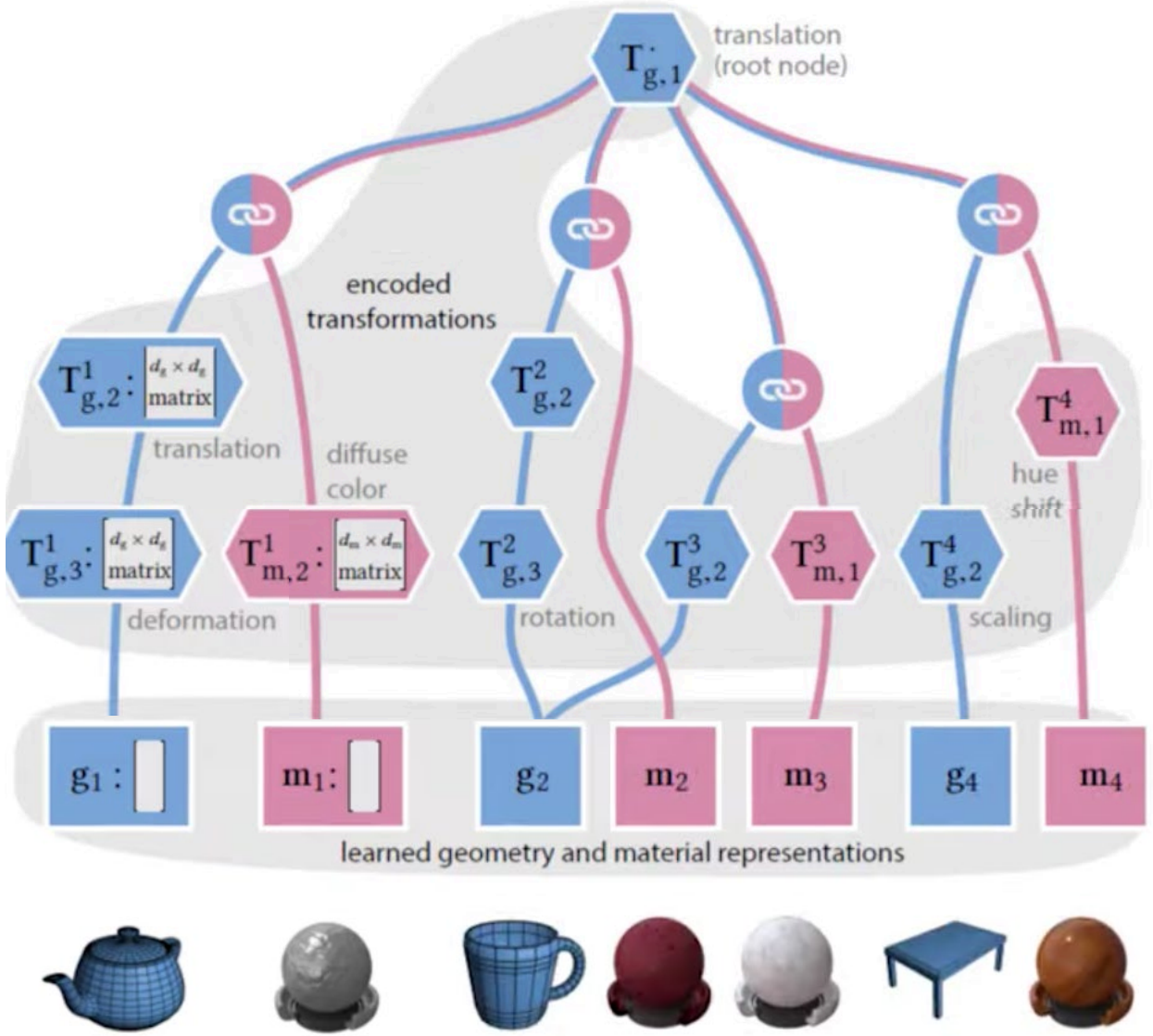
- Neural graph representation: Enables the design of scenes composed of neural primitives
- Lifted transformation space: Allows independent manipulation of orthogonal material and geometry attributes of the neural primitives
- Streaming Renderer: Processes neural scene graph to render RGB images with differentiable operations

Neural Graph Representation

Traditional Scene Graph

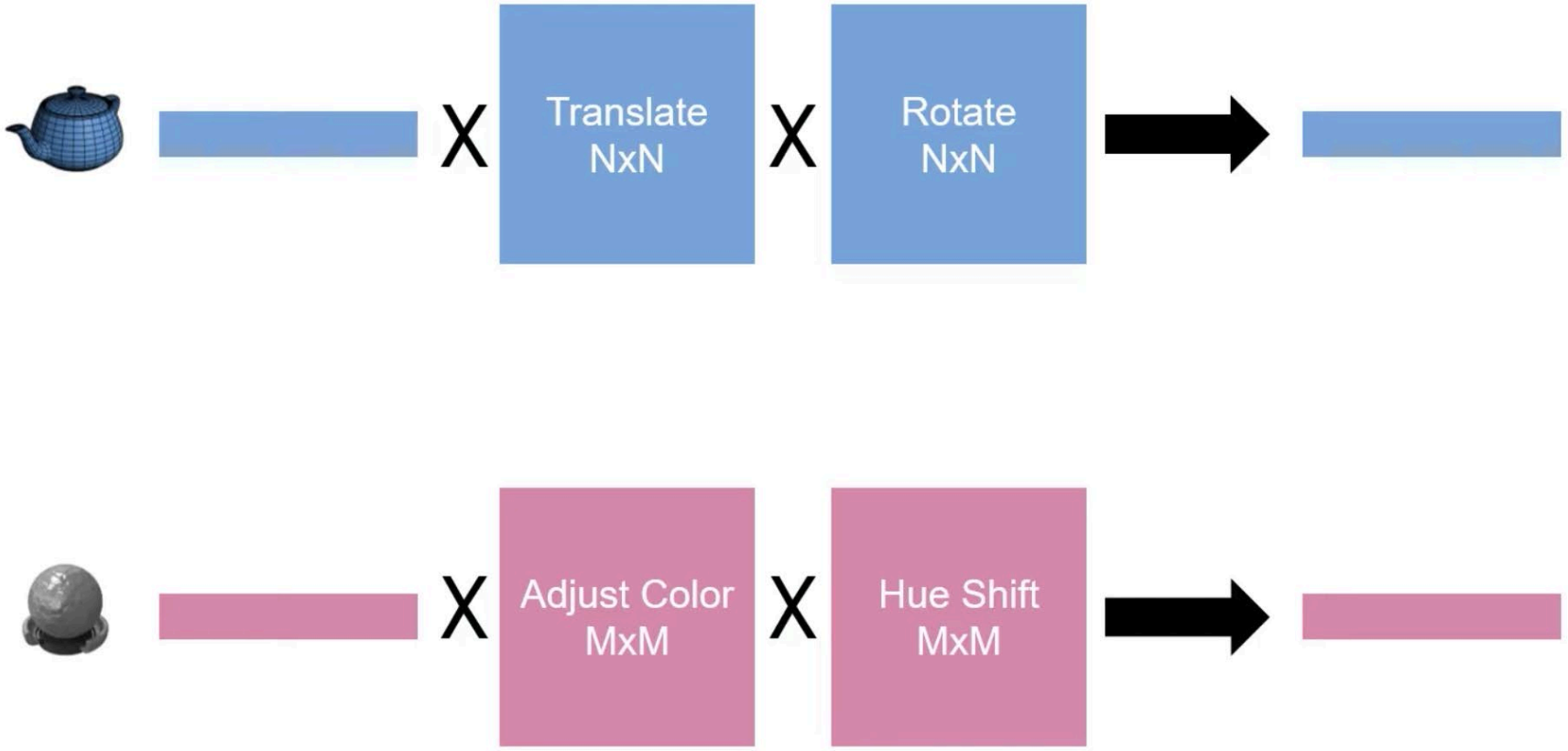


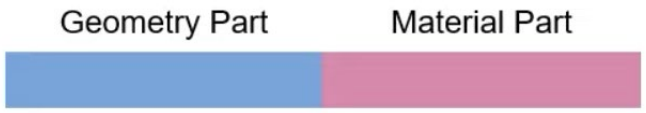
Neural Scene Graph



Lifted Transformation Space

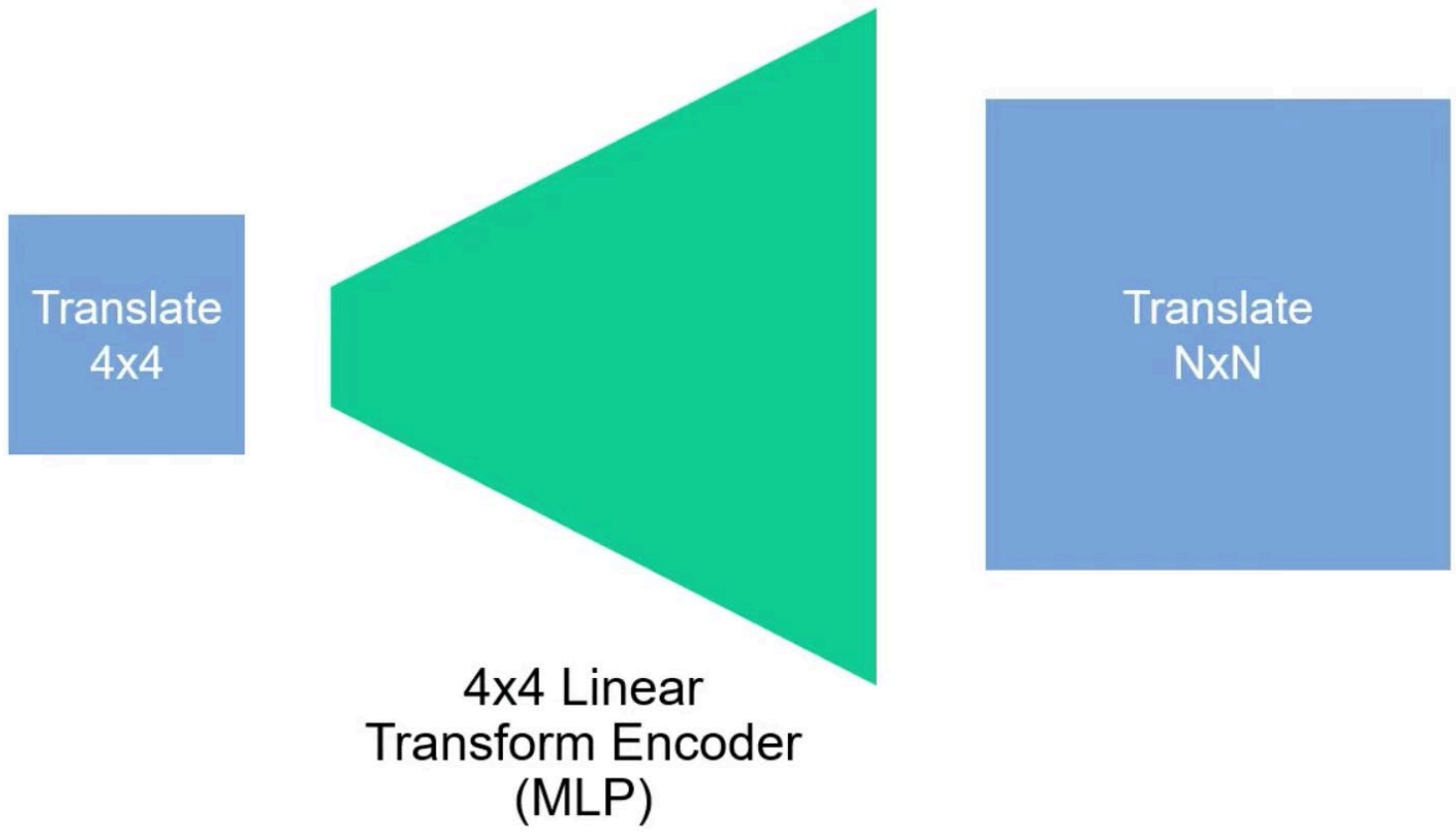
Forming Object Representations



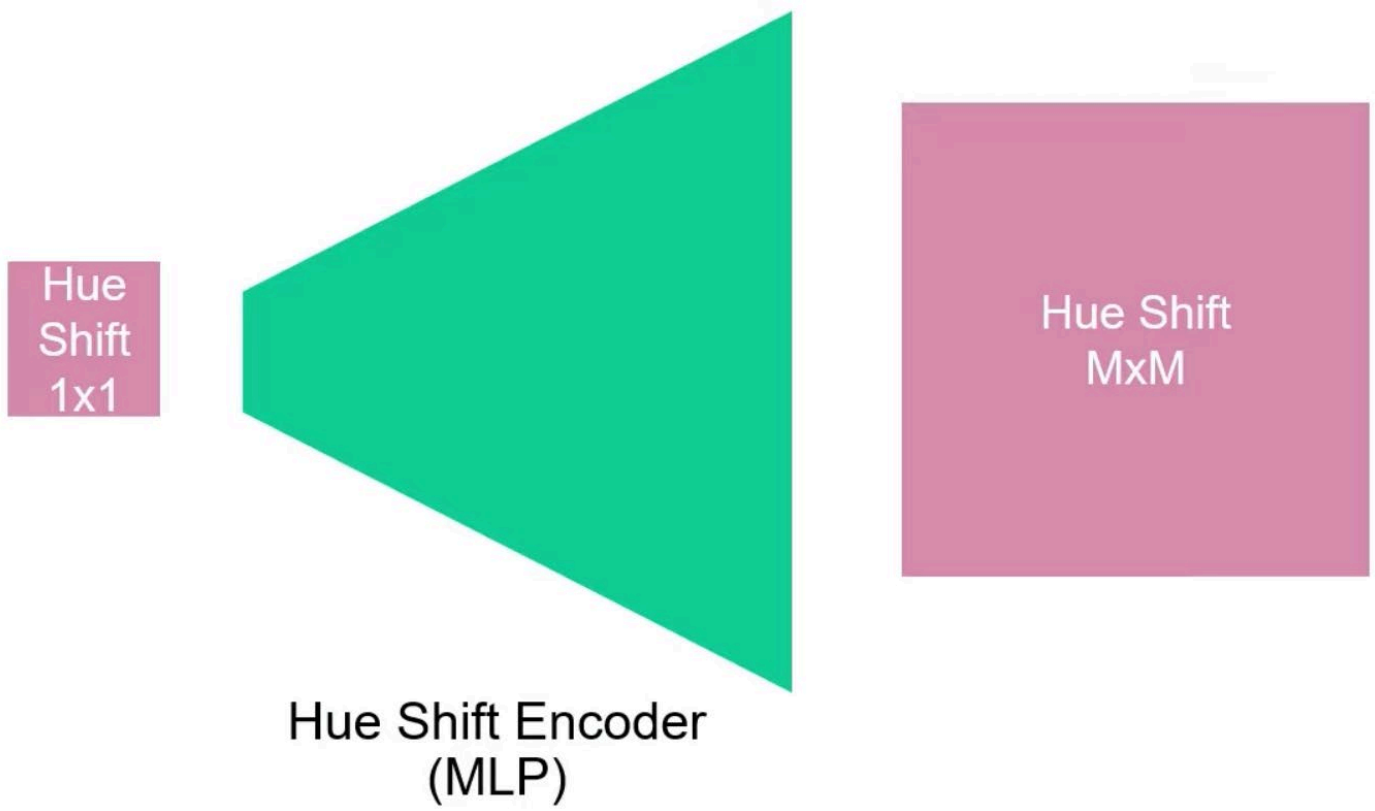


Final Object Representation

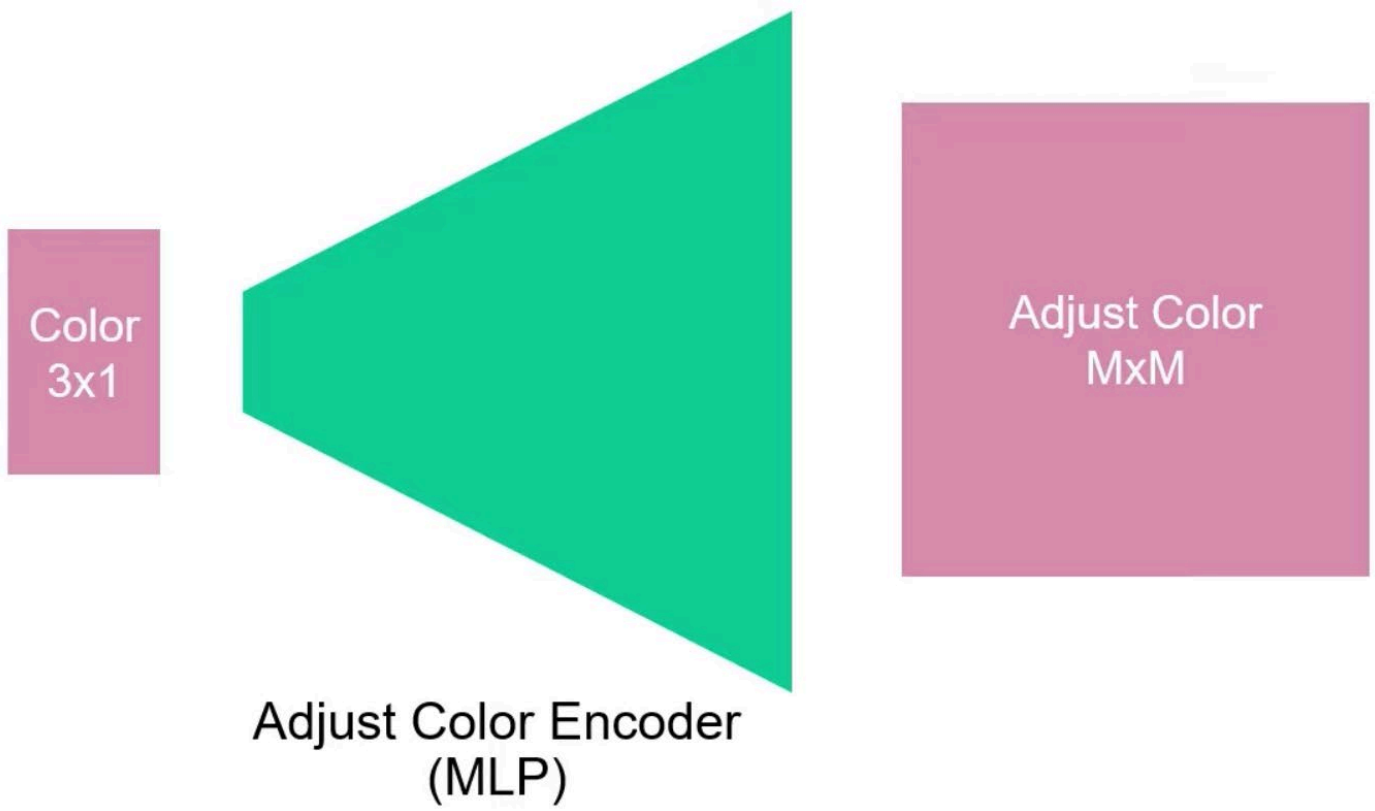
Lifted Translation



Lifted Hue Shift

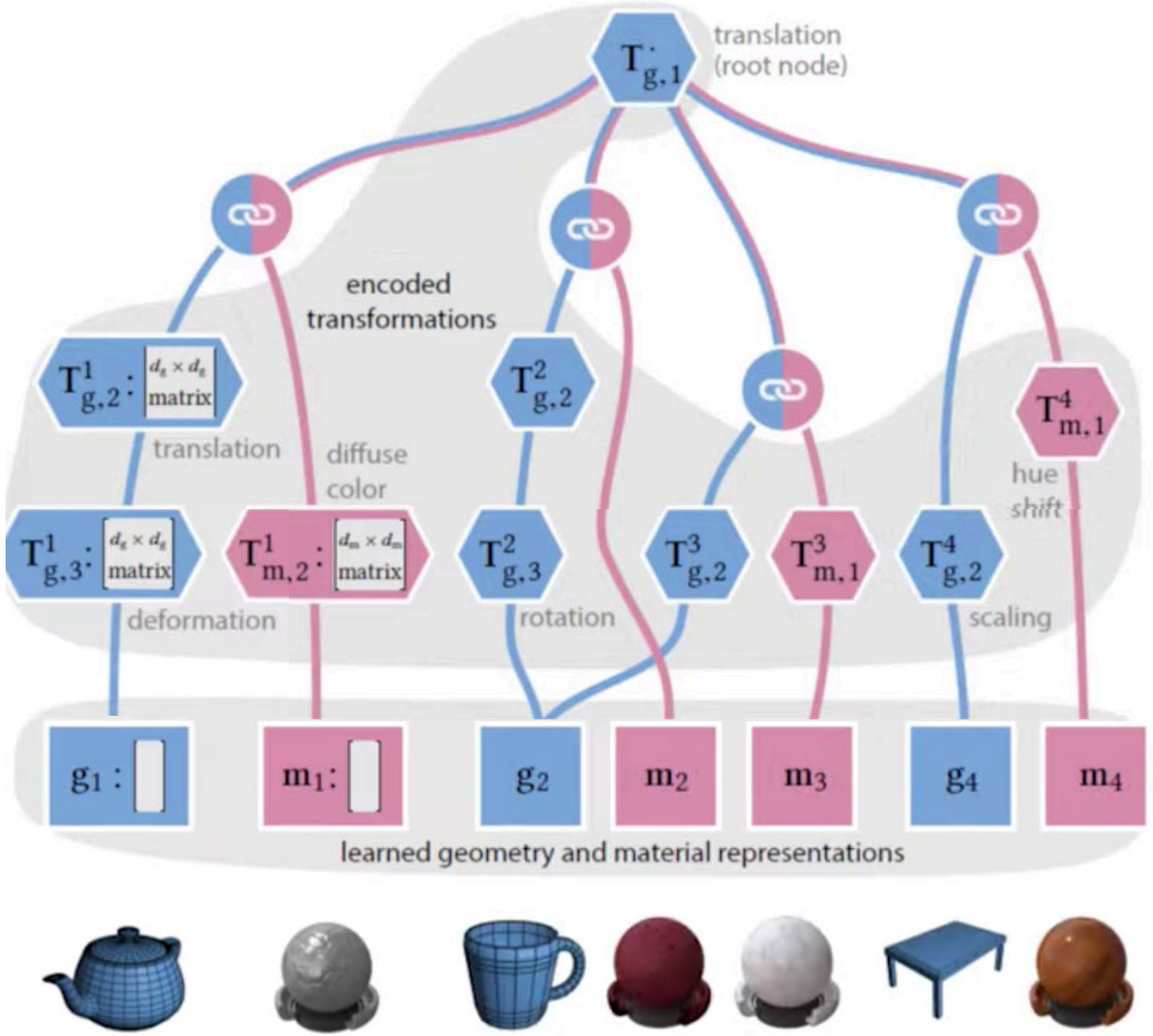


Lifted Color Transformation

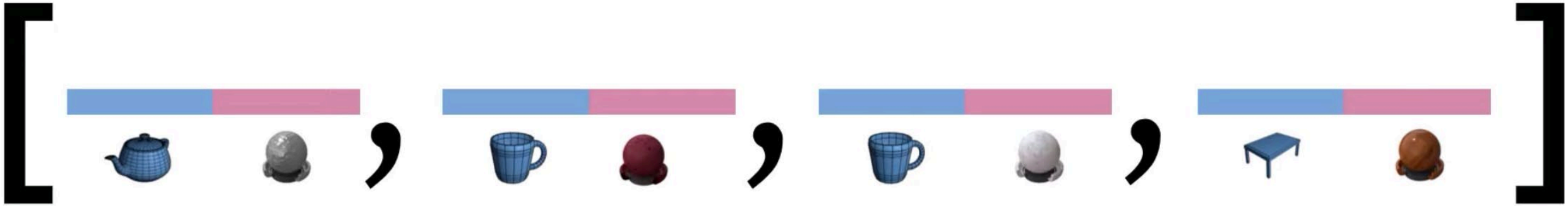


Streaming Renderer

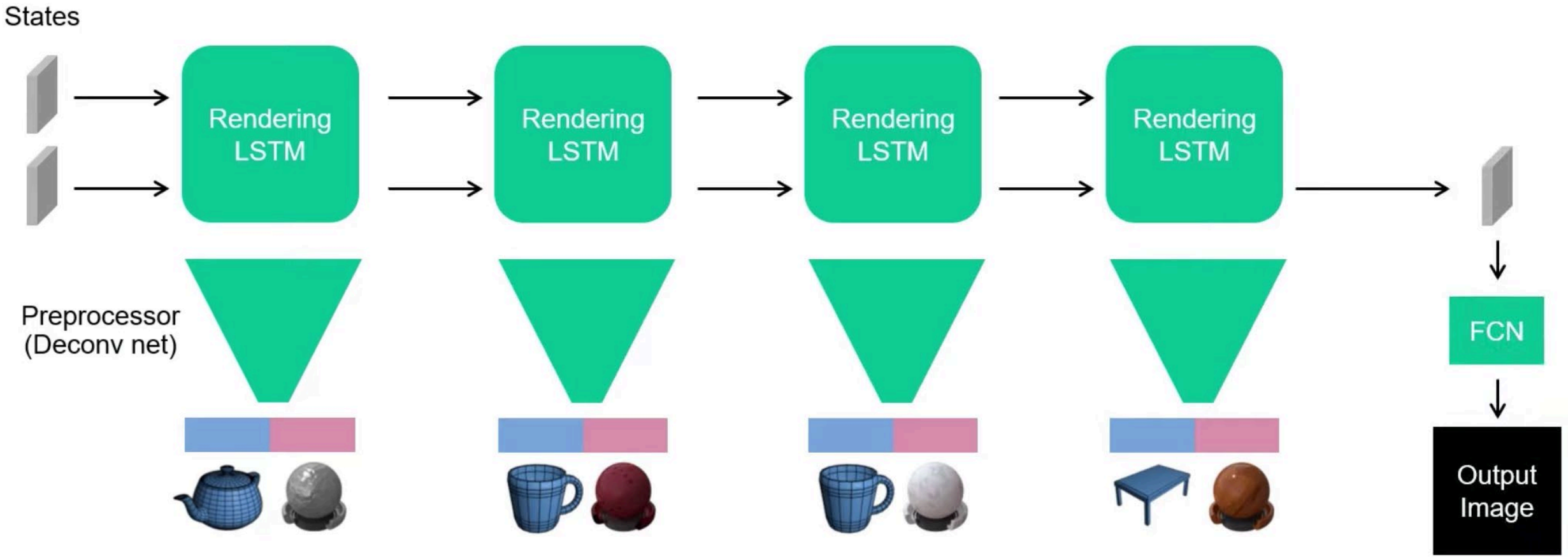
Neural Scene Graph



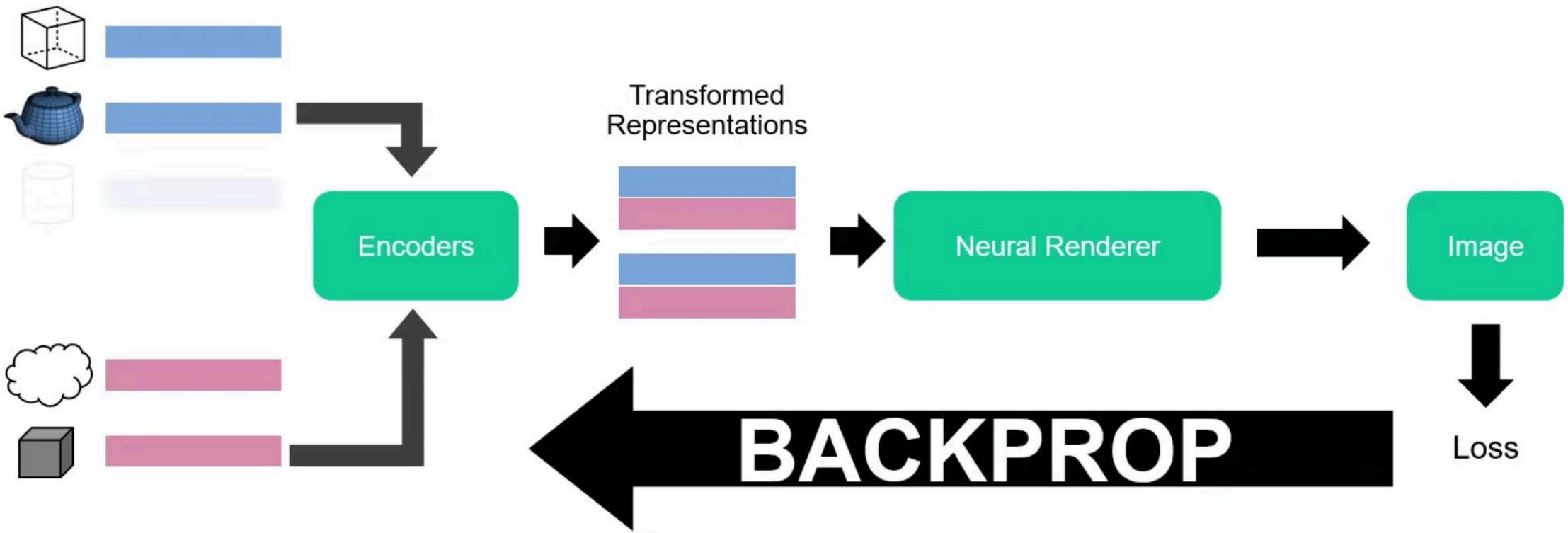
Input to Streaming Renderer



Streaming Renderer

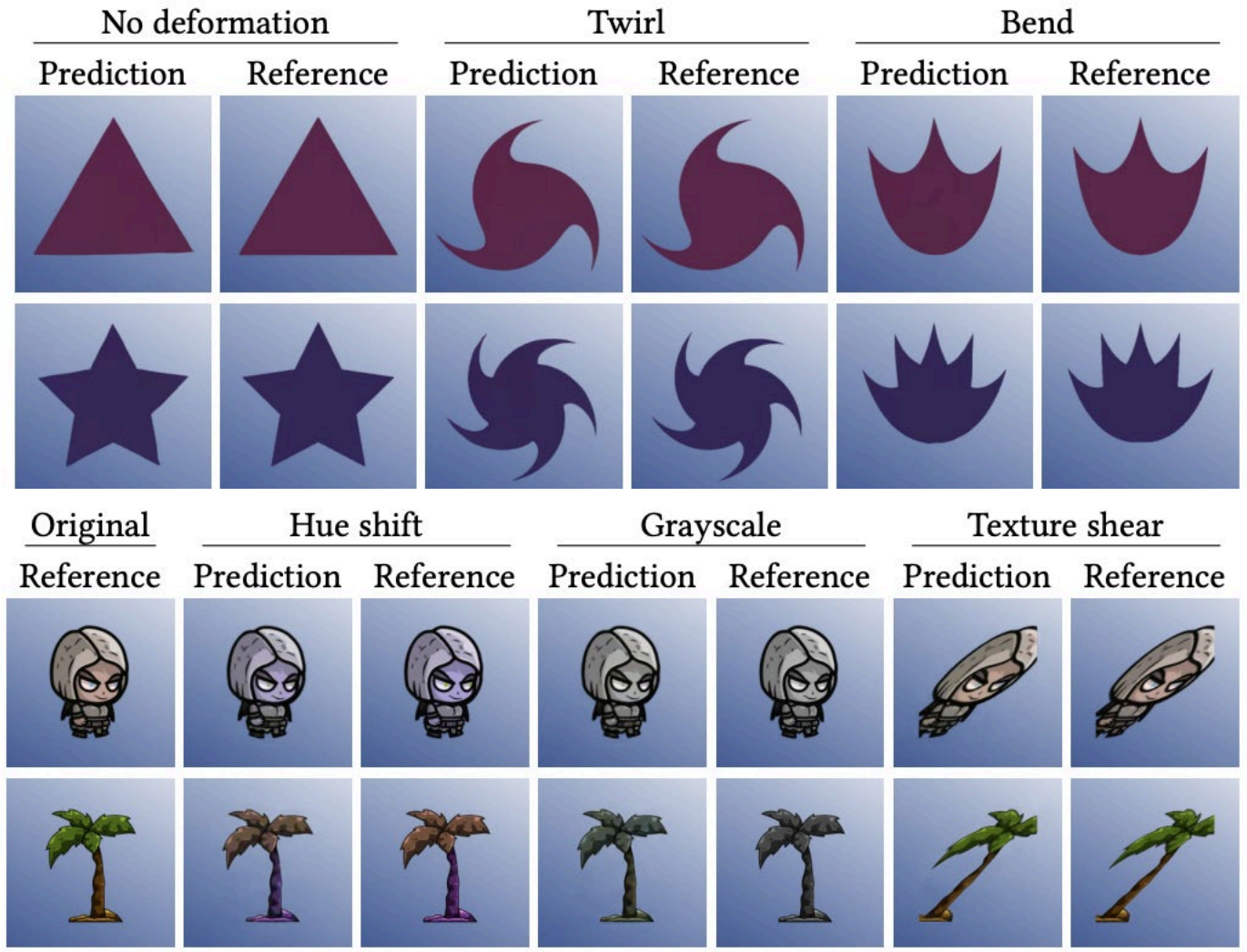


Optimization

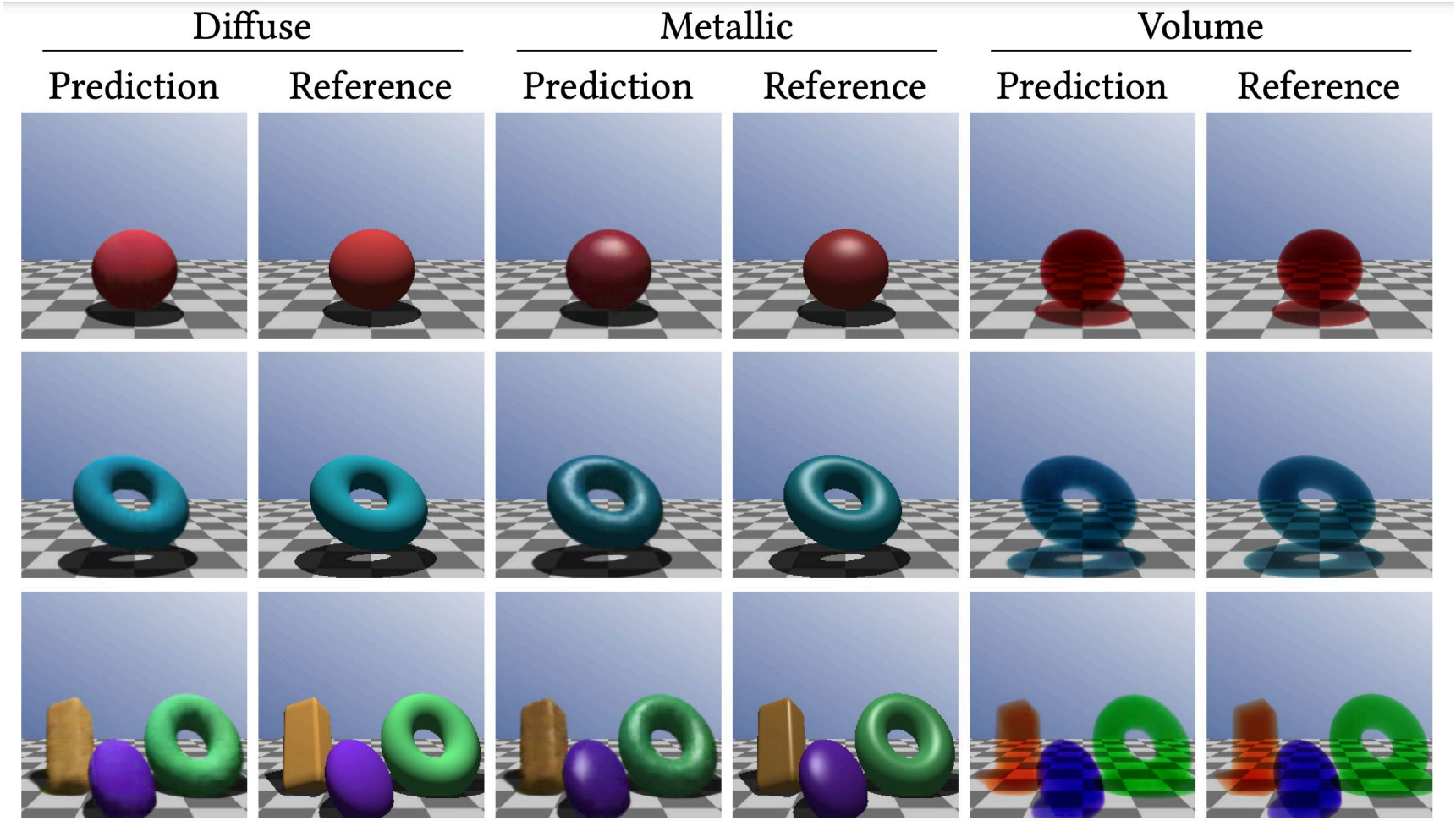


Results

Results

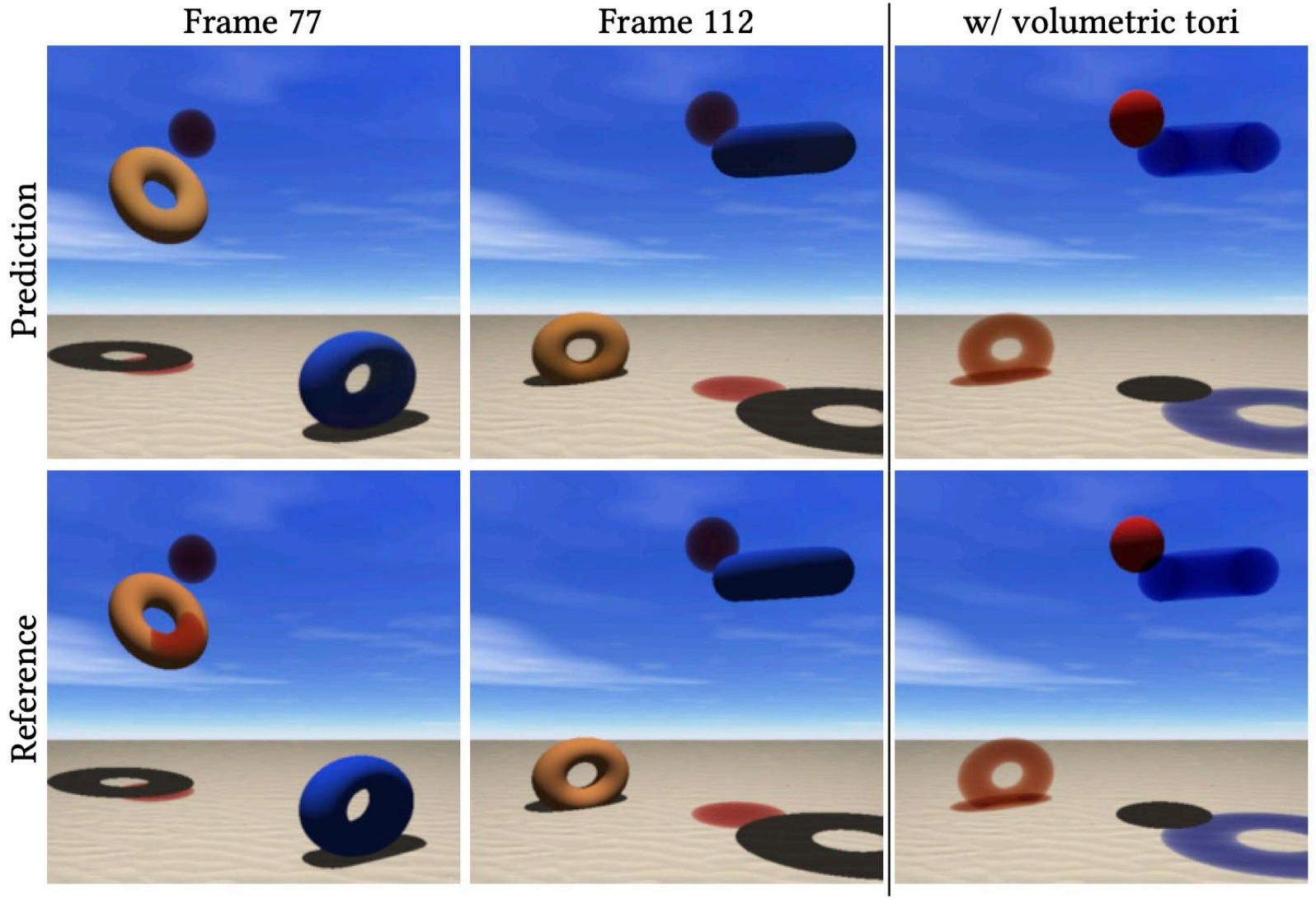

No deformation
Prediction
Reference
Twirl
Prediction
Reference
Bend
Prediction
Reference
Original
Reference
Hue shift
Prediction
Reference
Grayscale
Prediction
Reference
Texture shear
Prediction
Reference

Orthogonality

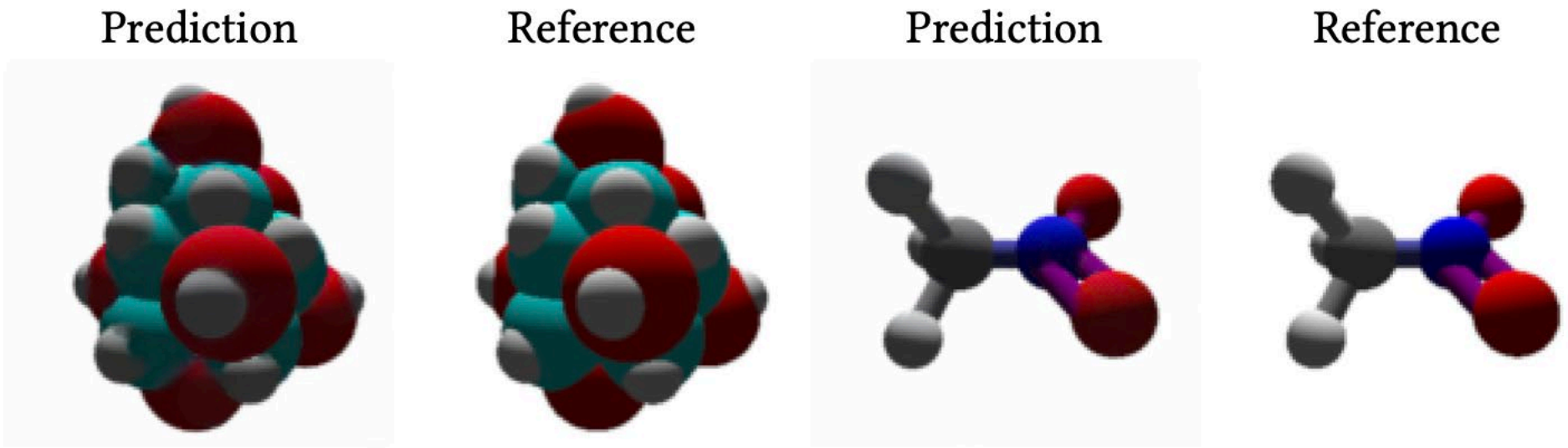


Temporally Stable Interpolation

3D Results



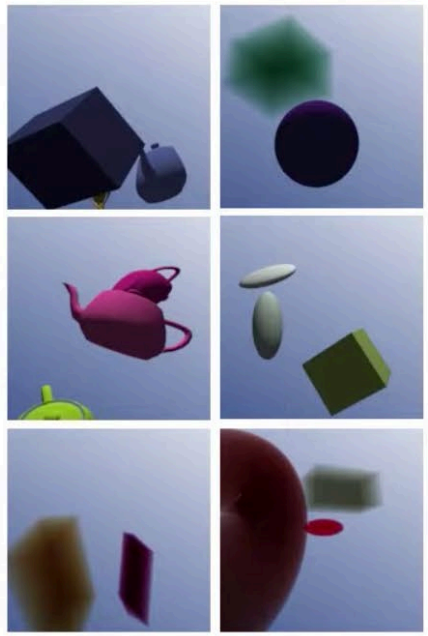
Occlusion



Scalability

Generalizing to New Material-Geometry Pairings

Training Data Examples



Diffuse Prediction

Volumetric Prediction

Summary

- Neural graph representation: Enables the design of scenes composed of neural primitives
- Lifted transformation space: Allows independent manipulation of orthogonal material and geometry attributes of the neural primitives
- Streaming Renderer: Processes neural scene graph to render RGB images with differentiable operations
- Results demonstrated many desirable properties on 2D and 3D

Challenges

- Limited to training data and simple scenes
- Struggles with interactions between dynamic scene elements
- Currently only handles static lighting
- Does not integrate any graphics priors into rendering