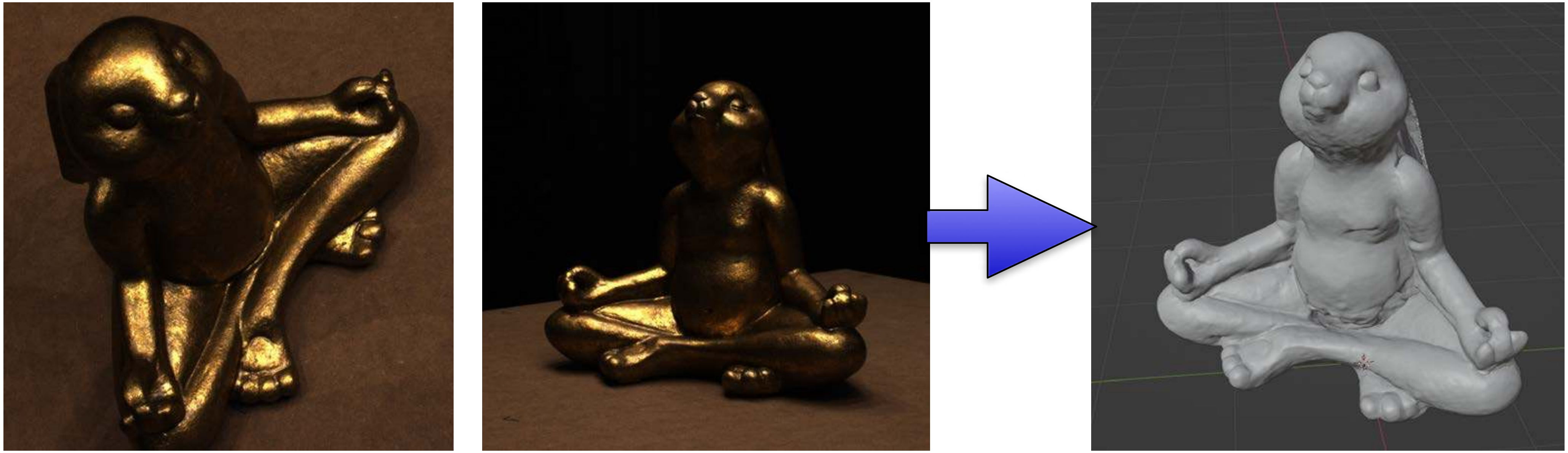
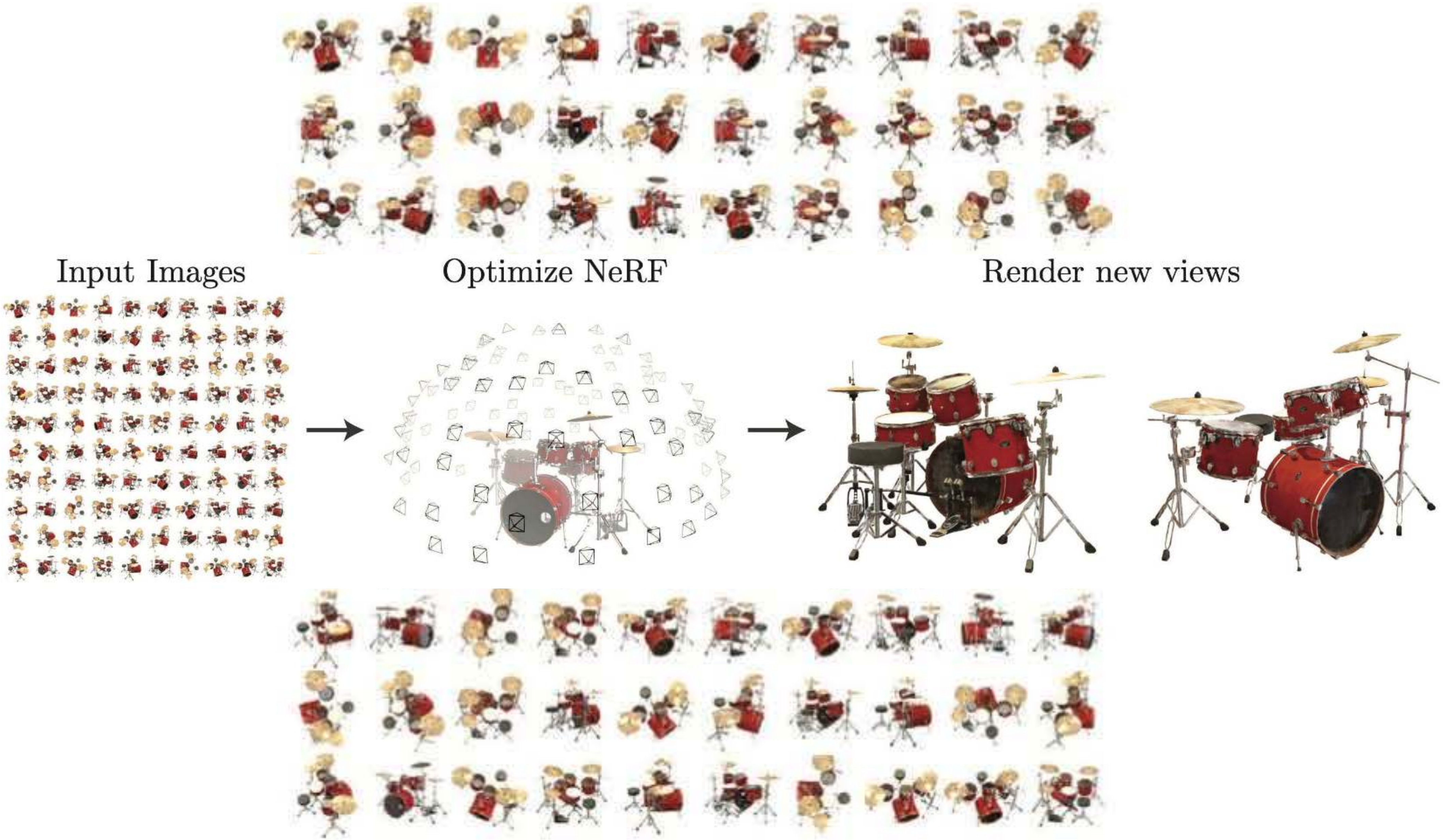
# Neural Radiance Fields and Surfaces

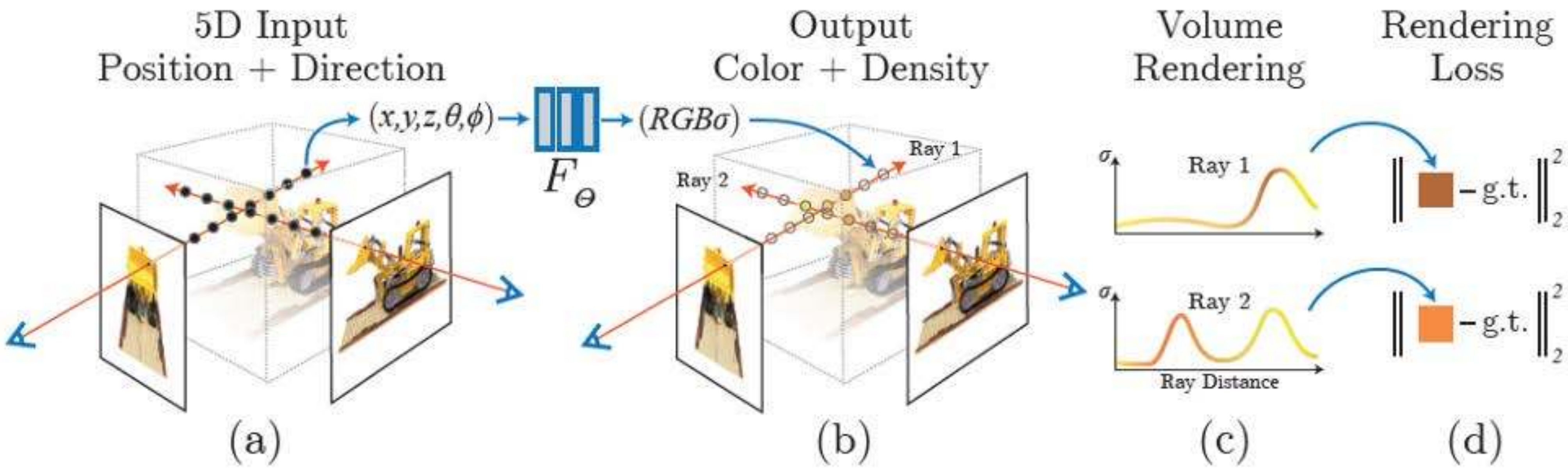


# Neural Radiance Fields




Multiple views of a complex scene

# Neural Radiance Fields




A. Sampling 5D coordinates---location $x, y, z$ and viewing direction $\theta, \phi$---along camera rays.
B. Feeding those locations into an MLP to produce a color and volume density.
C. Using volume rendering techniques to composite these values into an image.
D. Optimizing scene representation by minimizing the residual between synthesized and ground truth images.

# Physically Inspired Volume Rendering

For a ray $\mathbf{r}(t) = \mathbf{o} + t\mathbf{d}$, the rendered color can be computed as

$$C(\mathbf{r}) = \int_{t_n}^{t_f} T(t)\sigma(\mathbf{r}(t))\mathbf{c}(\mathbf{r}(t), \mathbf{d})dt$$

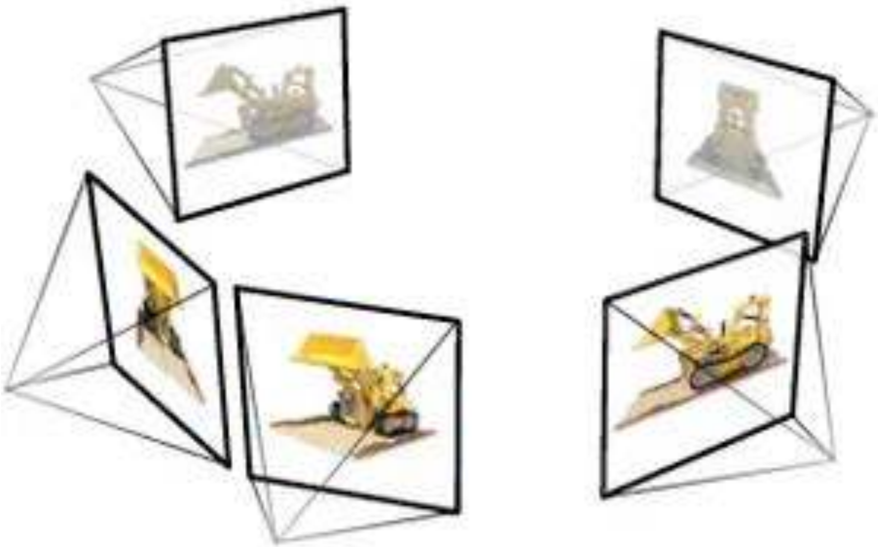
Density

Color

with $T(t) = \exp\left( - \int_{tn}^{t_f} \sigma(\mathbf{r}(s))ds \right)$

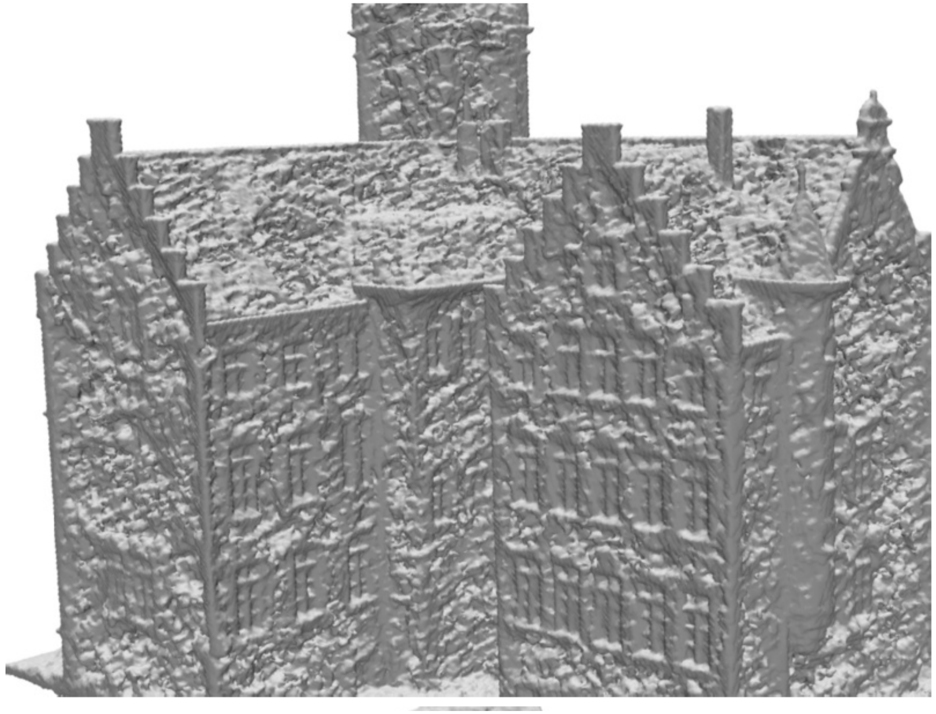
Transparency

# Neural Rendering



Given a few images of a tractor

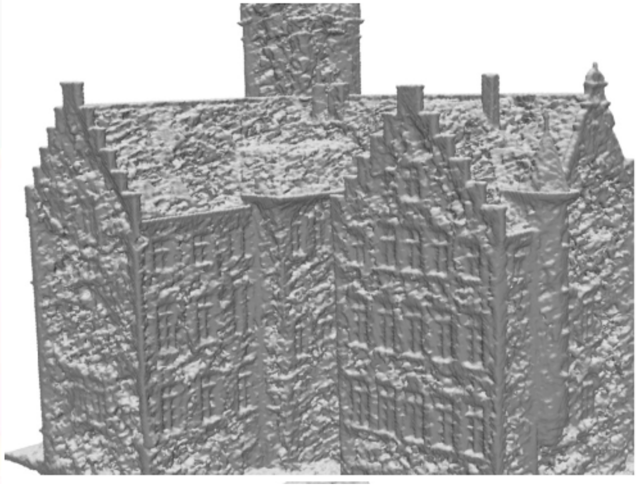
# Thresholding the Density



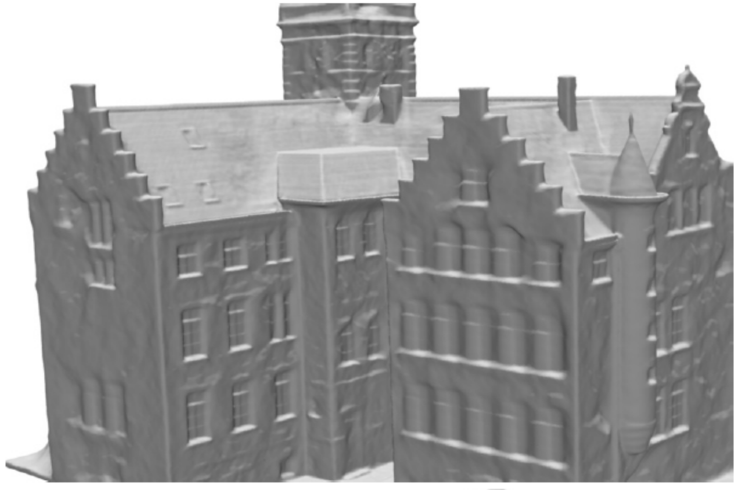
- Surfaces obtained by thresholding the density
- Choosing the threshold can be problematic

# From NerF to NeuS

Image



NeRF



NeuS

- Volume density is expressed a function of an SDF
- The reconstructed surfaces are smoother

# From Interpolation to Reconstruction


Images of a shiny statue

View Interpolation

3D Reconstruction