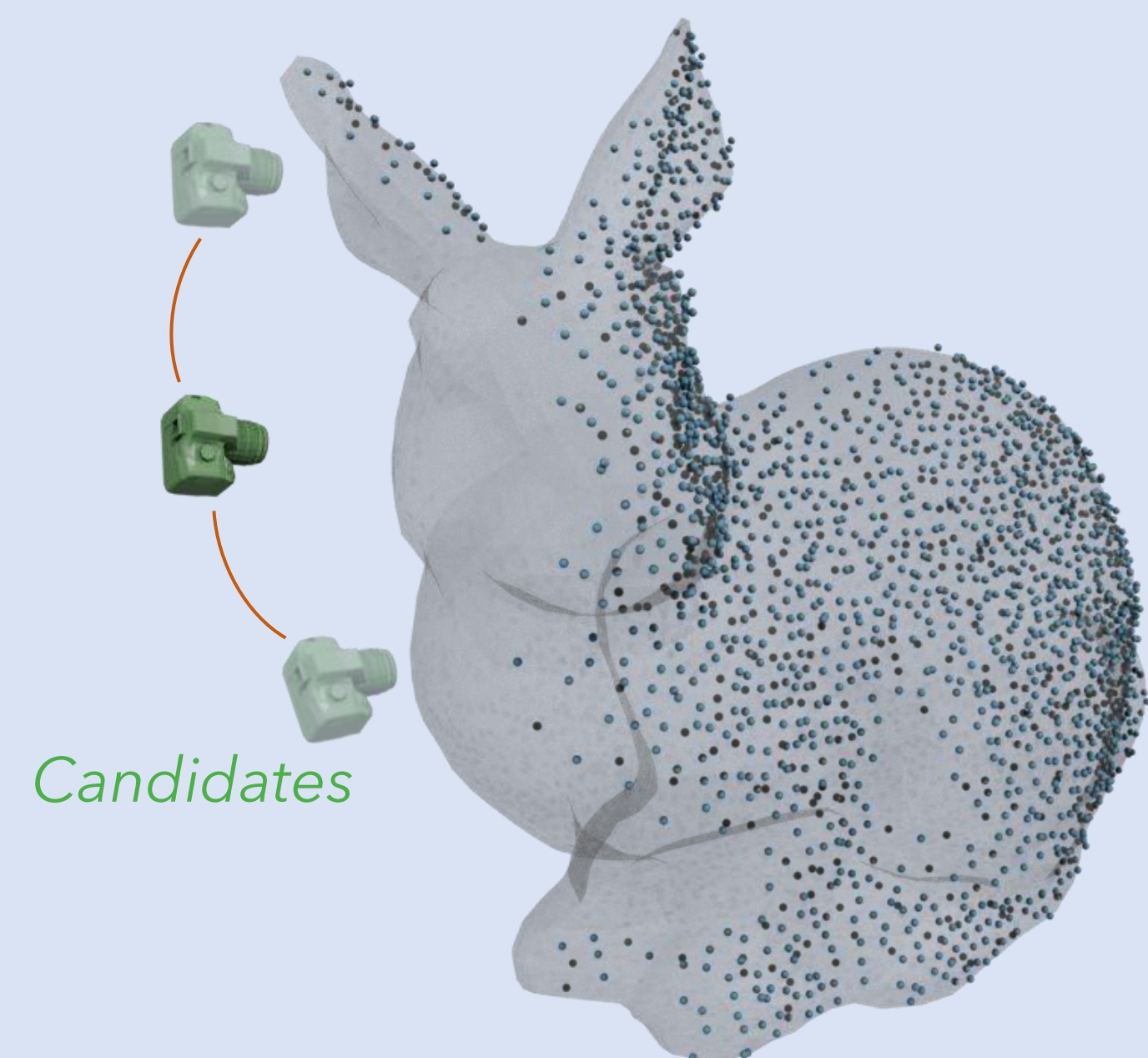


A *Bayesian* Approach for Task-Specific Next-Best-View Selection with Uncertain Geometry

Jingsen Zhu¹, Silvia Sellán², Alexander Terenin¹

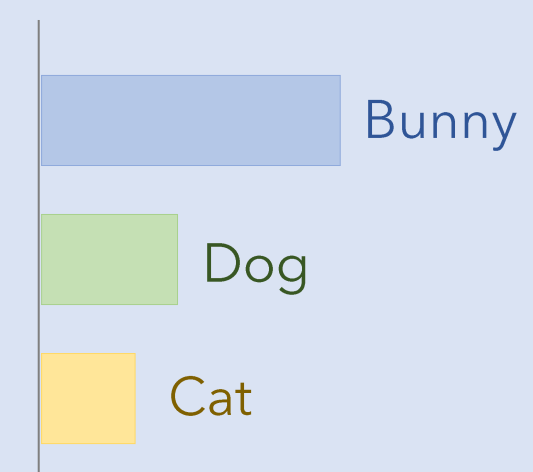
Problem

Given an *existing partial scan* of an object



Choose the *next best view* for the designated downstream tasks

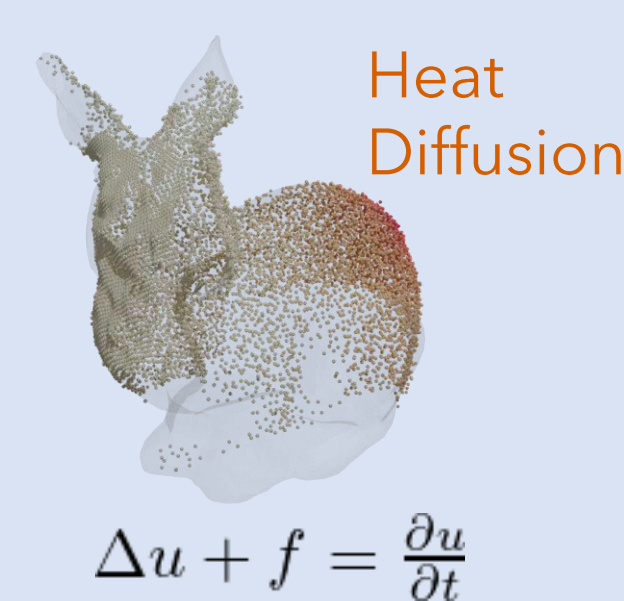
Classification



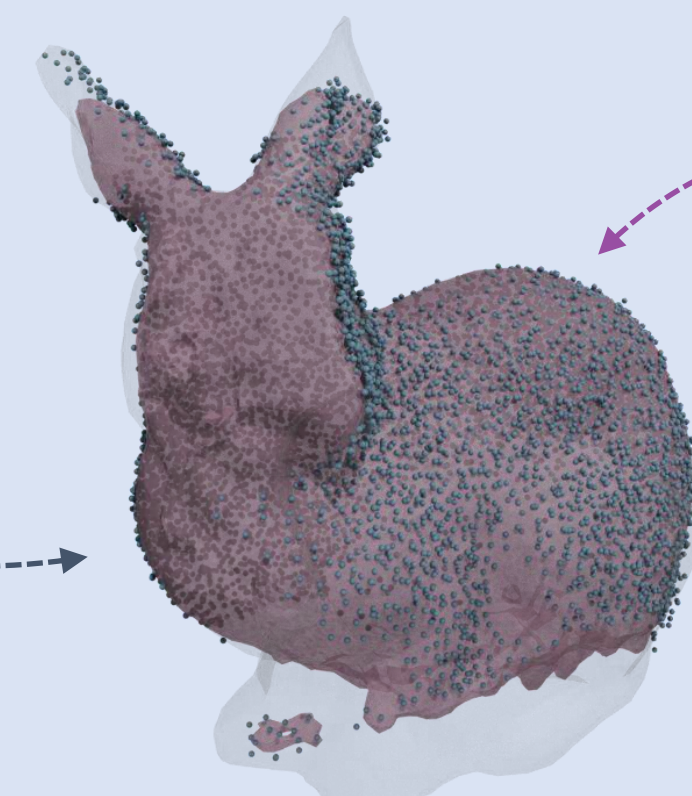
Segmentation



Physics Sim



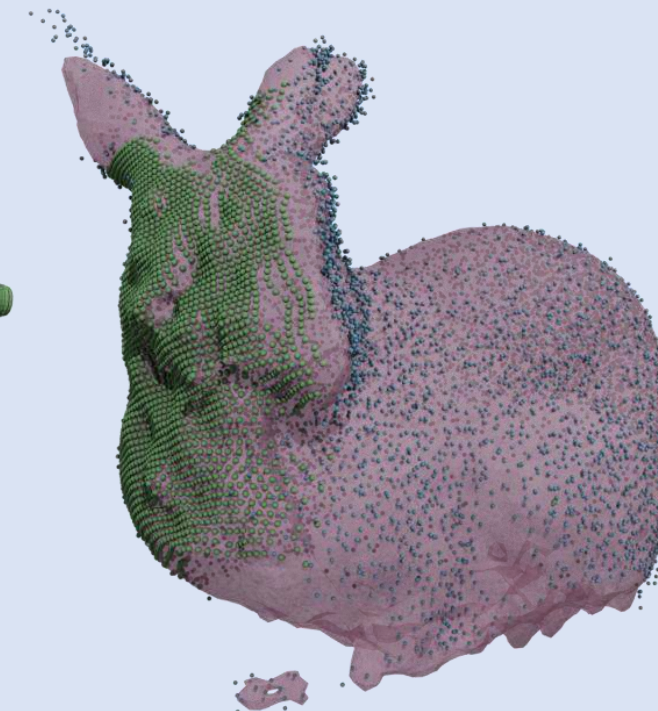
Method



Posterior sample from
Uncertainty Geometry
Reconstruction
 $\hat{f} \sim p(f | \mathcal{D}_t)$

$$\widehat{\mathcal{D}_{t+1}} = \mathcal{D}_t \cup \text{scan}(\theta; \hat{f})$$

Simulate next scan
from posterior geometry sample



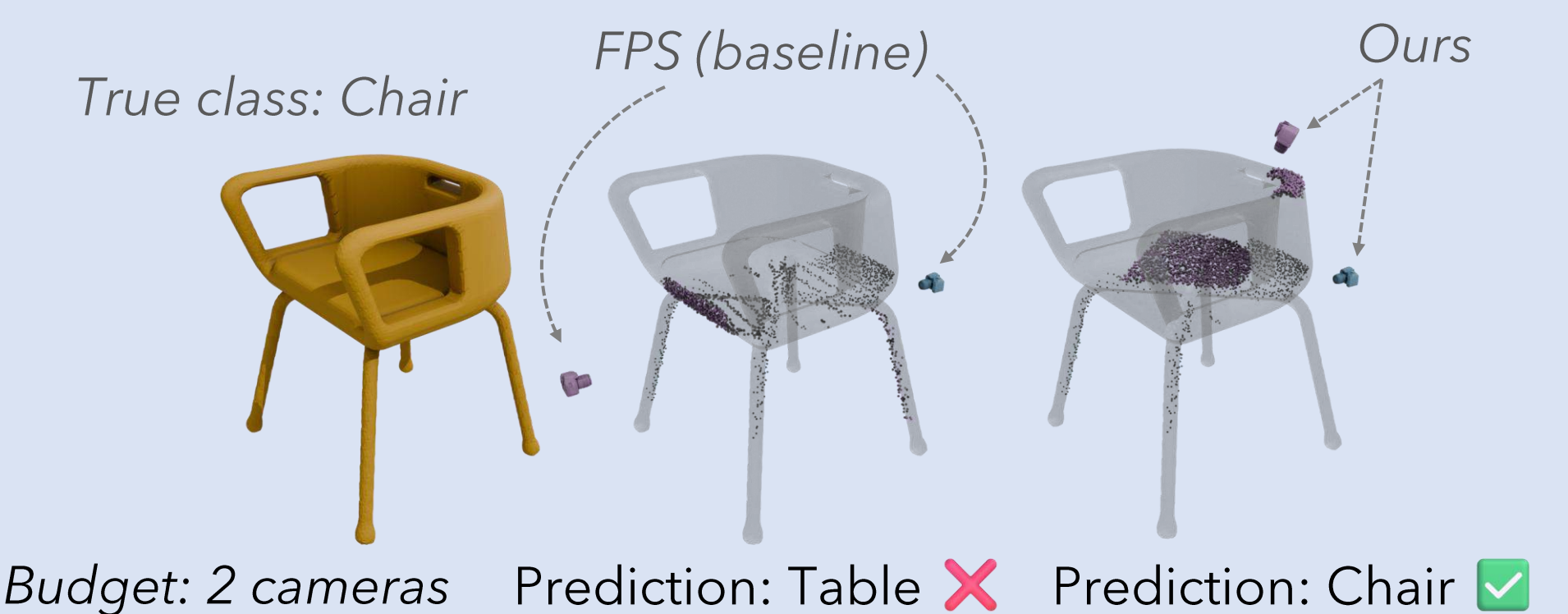
The next view is selected by maximizing the *task-specific acquisition function*

$$\theta_{t+1} = \arg \max_{\theta} \alpha_{f|\mathcal{D}_t}^{(\text{task})} \left(\widehat{\mathcal{D}_{t+1}}, \mathcal{D}_t; \theta \right)$$

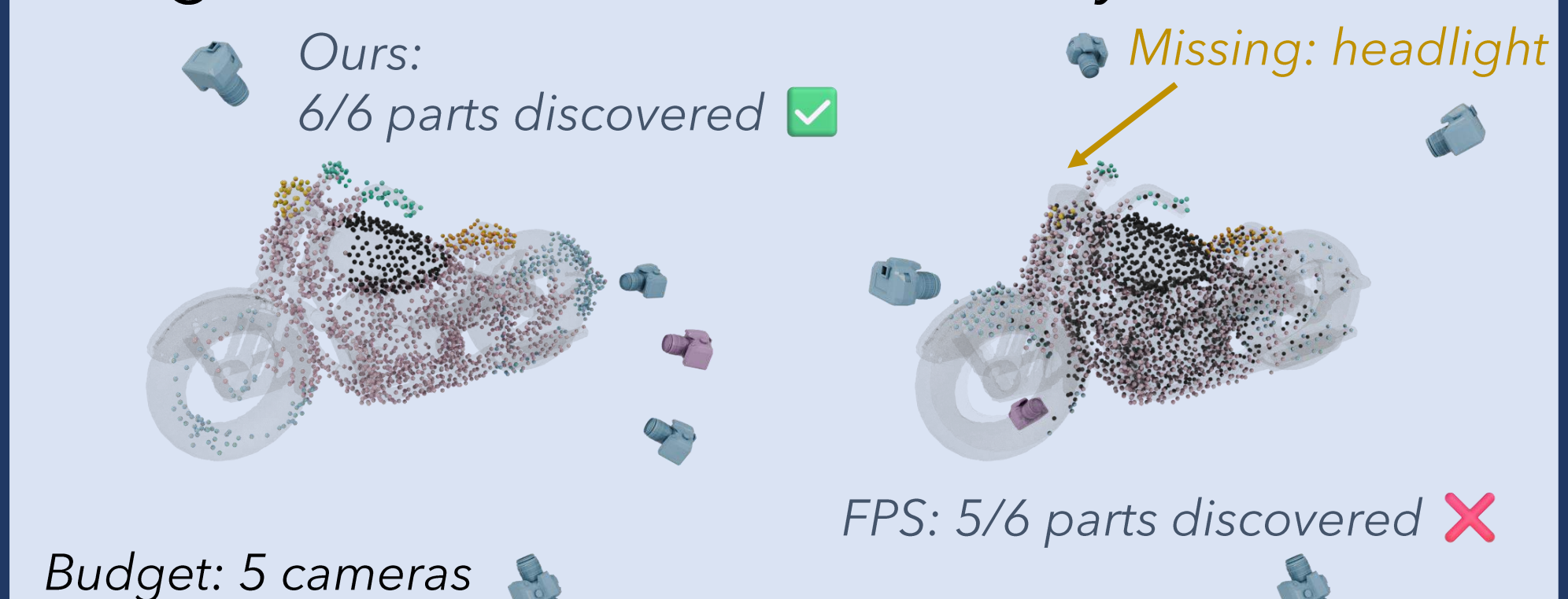
which evaluates the expected utility improvement between the *existing partial scan* and the *simulated next scan*

Results

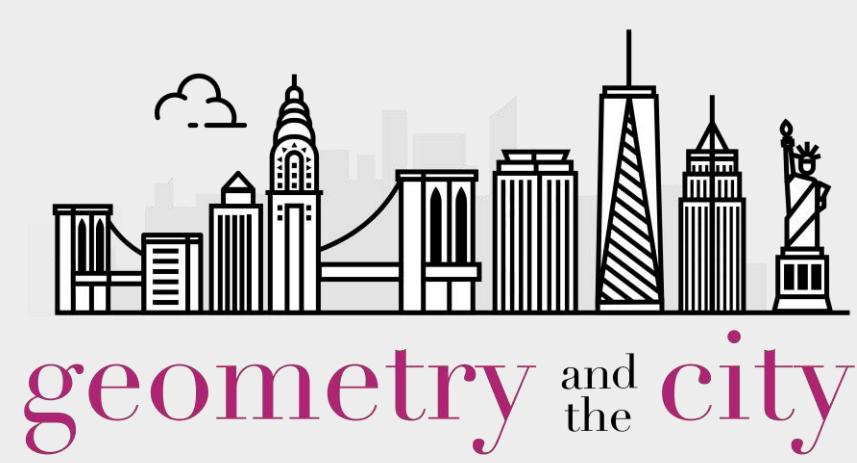
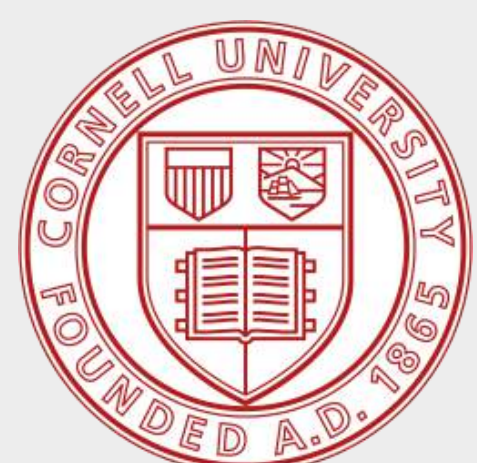
Classification



Segmentation – Part Discovery



Physics Simulation – Heat Diffusion



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