

# VisiPrint: Previewing 3D-Print Appearances from Real Material Samples

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Sooyeon Ahn<sup>2</sup>

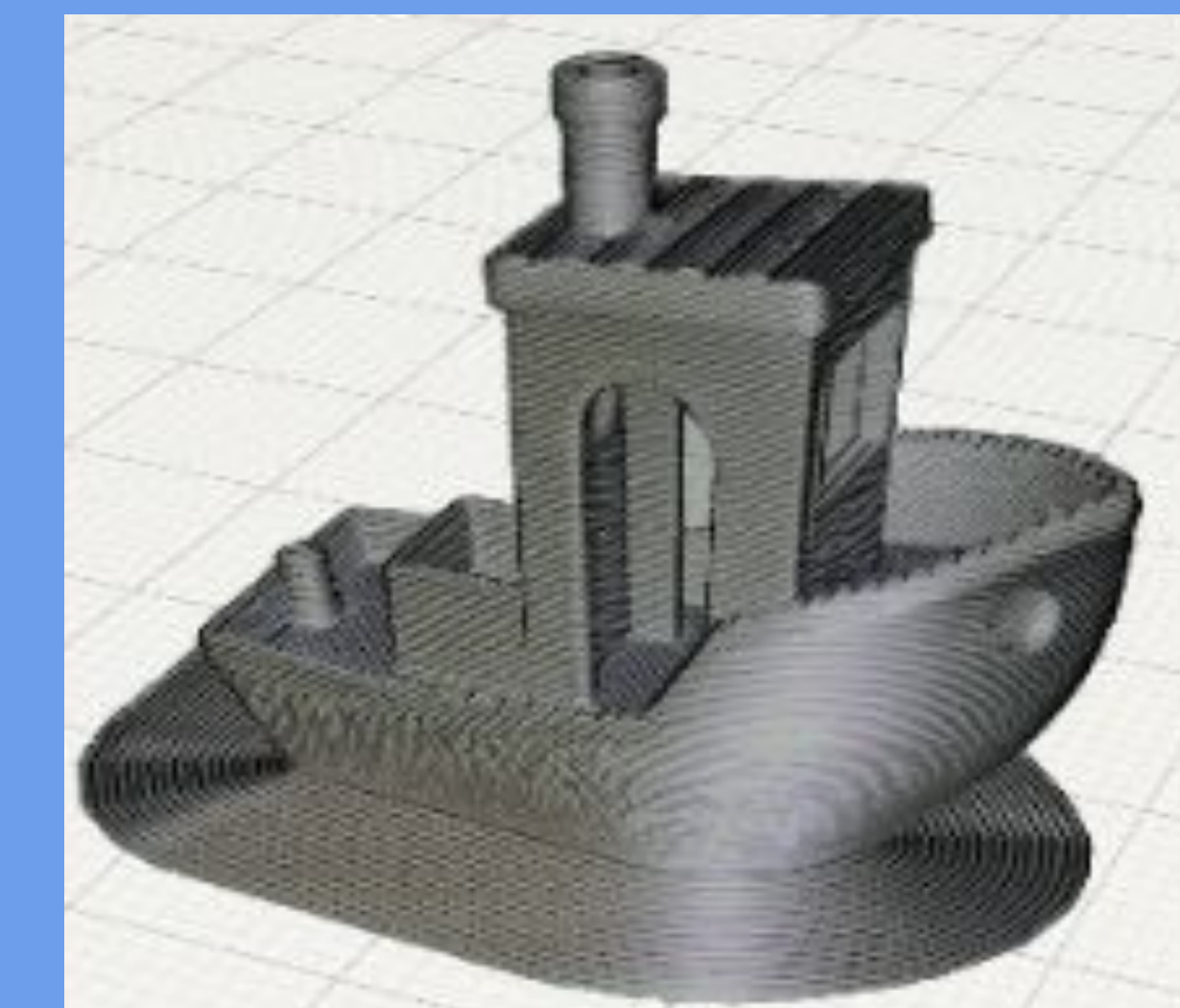
Raul Eduardo Hernandez<sup>1</sup>

Szymon Rusinkiewicz<sup>3</sup>

William Freeman<sup>1</sup>

Stefanie Mueller<sup>1</sup>

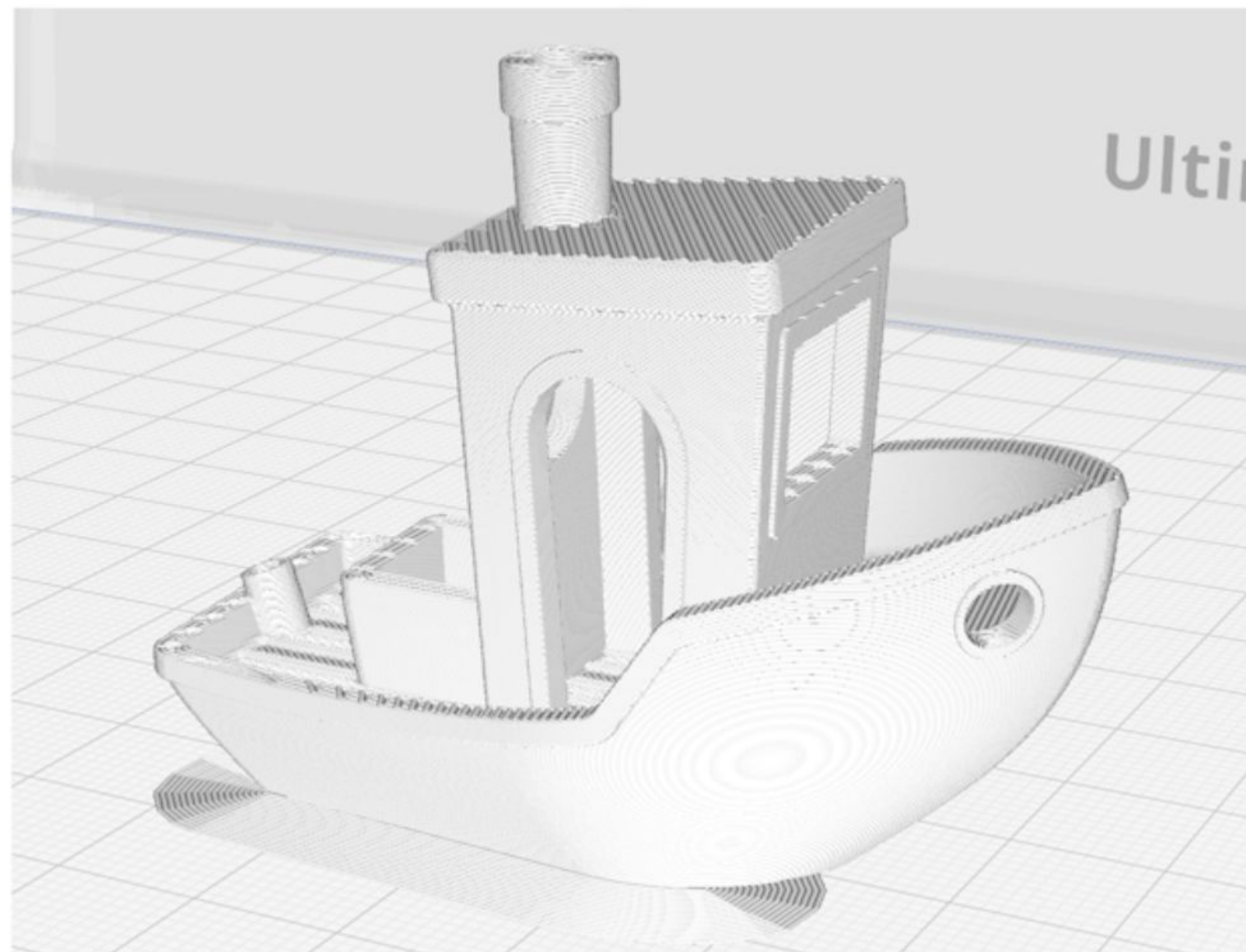
<sup>1</sup>MIT CSAIL, <sup>2</sup>GIST, <sup>3</sup>Princeton University



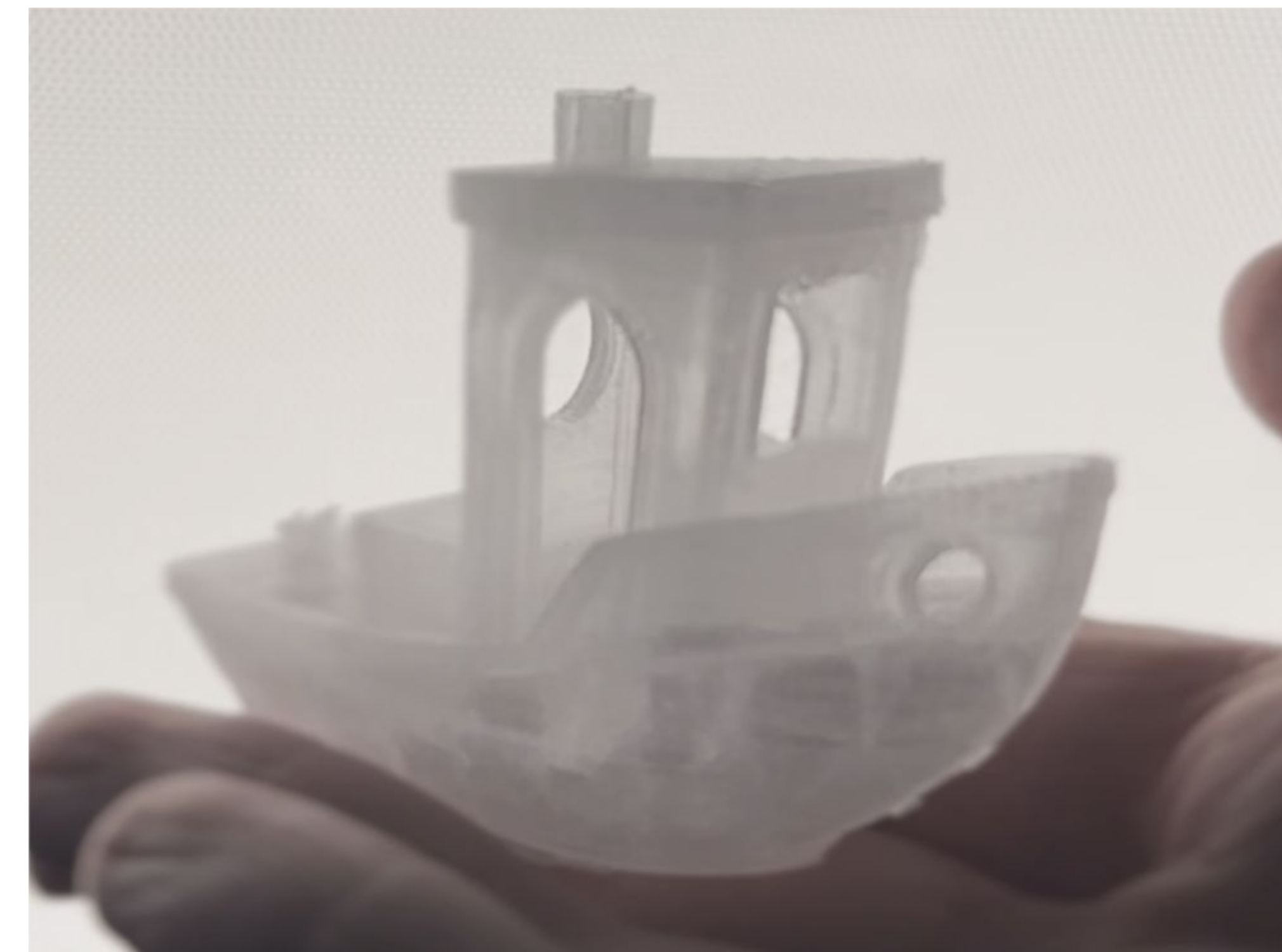
# FDM 3D printing has revolutionized personal fabrication...

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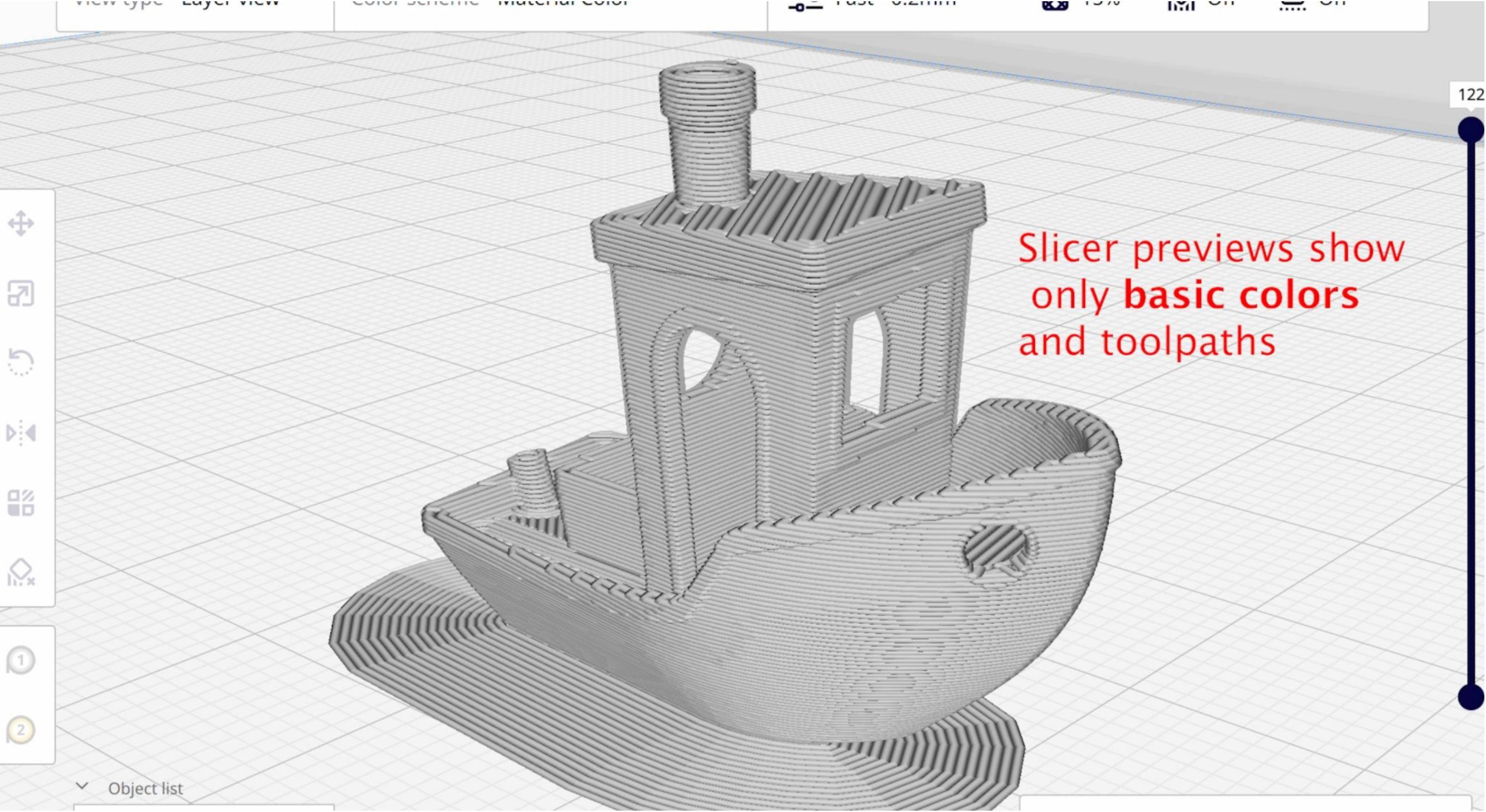
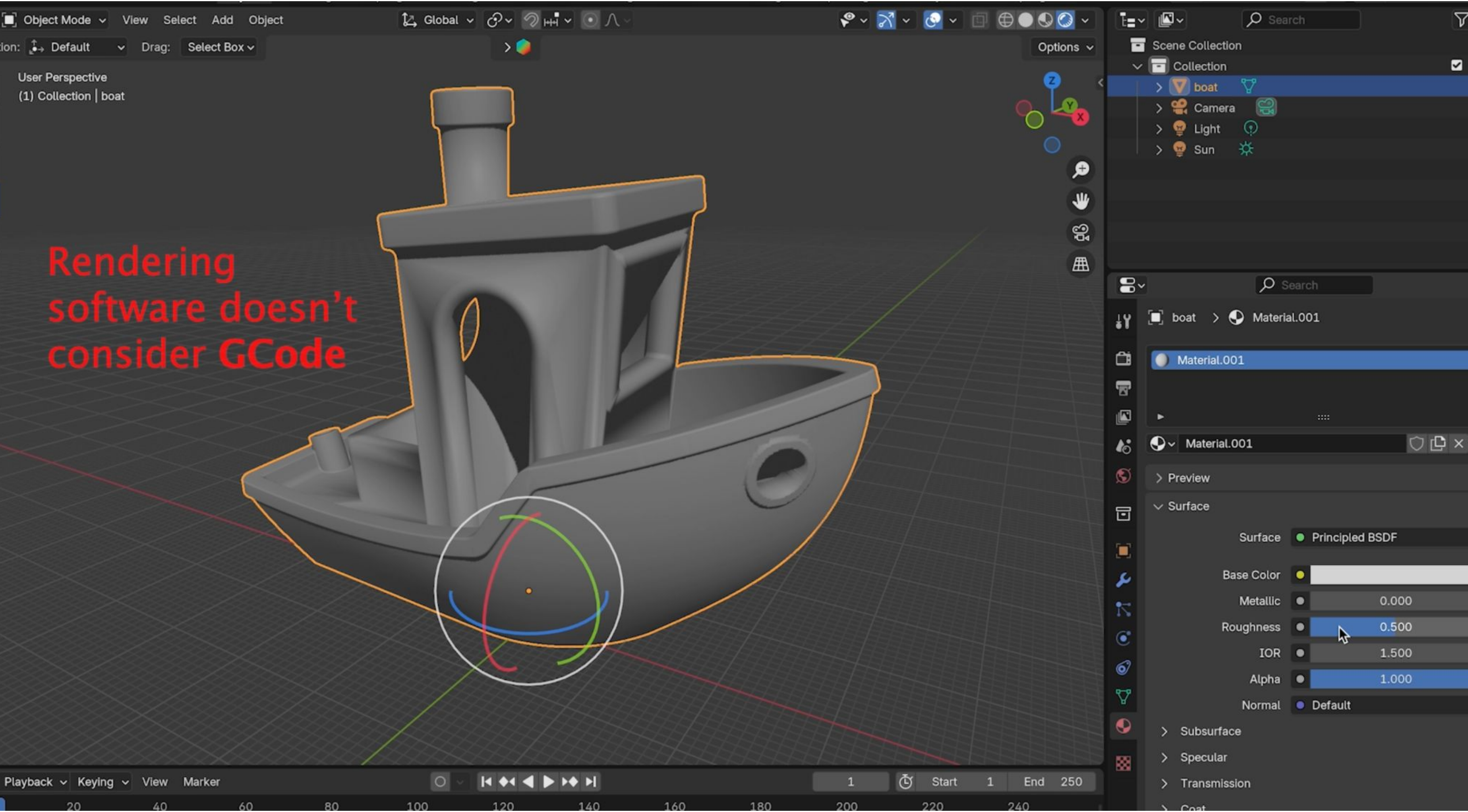
But existing preview tools don't faithfully show what your print will **really look like**.



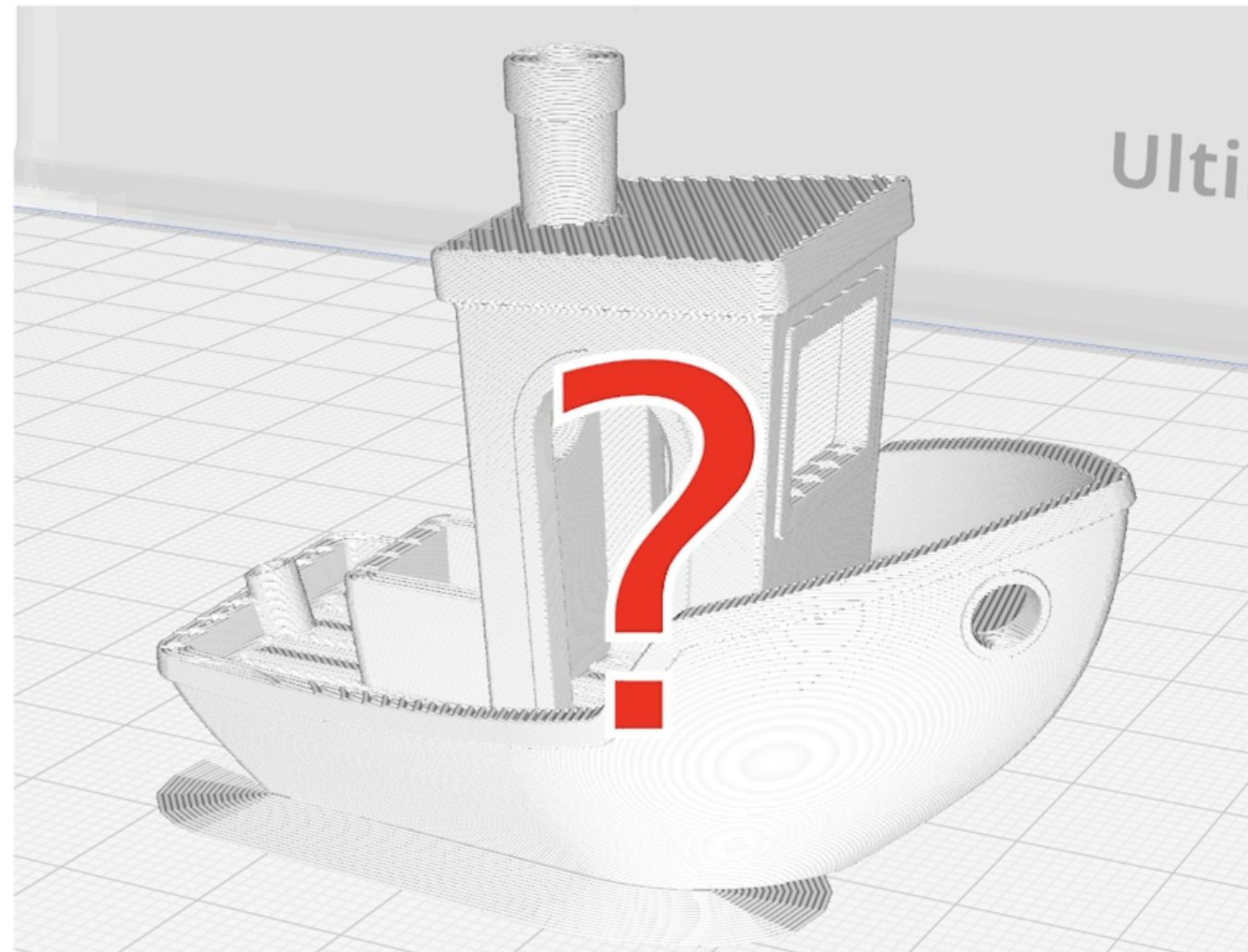
Ultimaker Cura preview with Transparent PLA



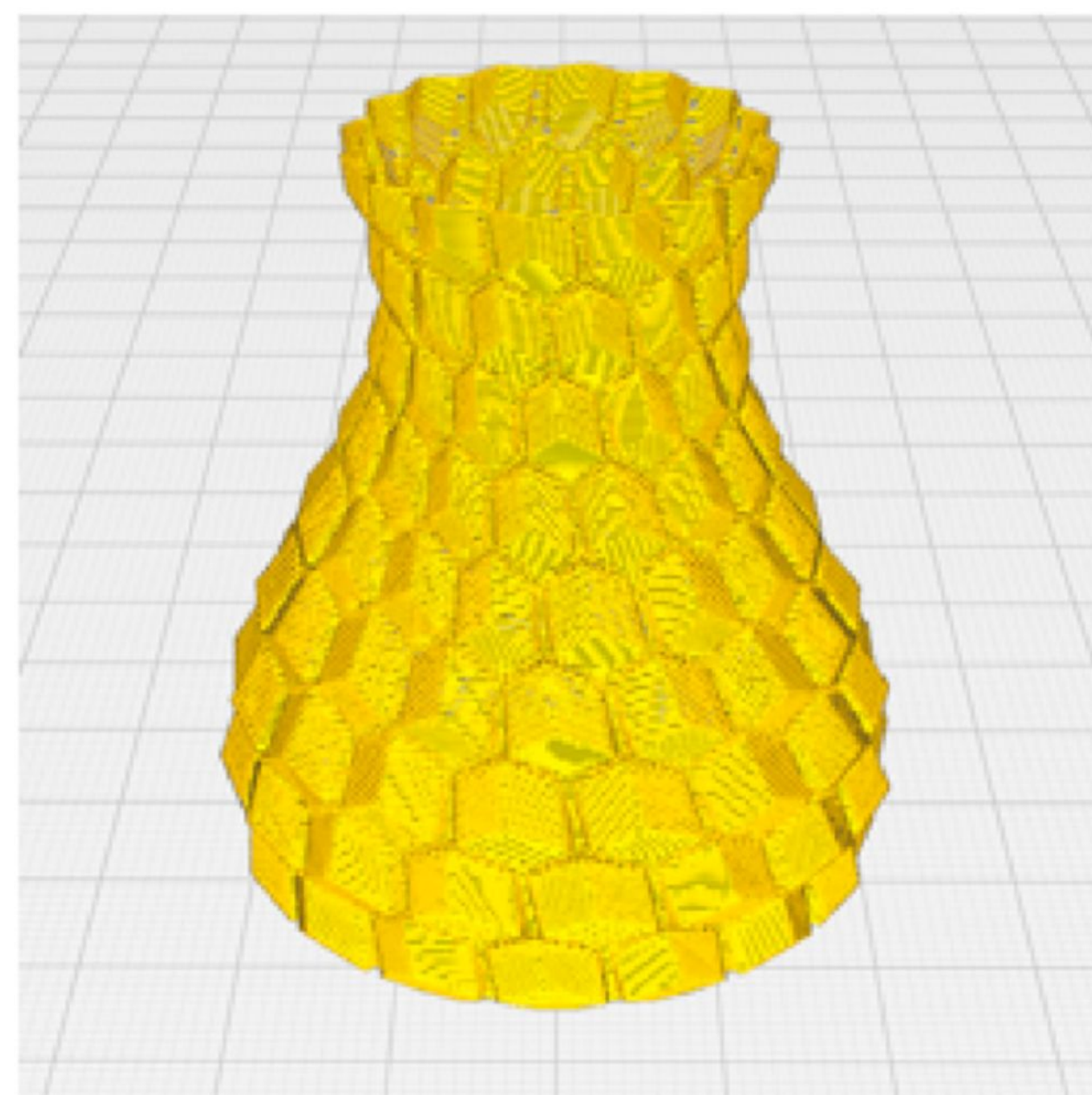
Real Transparent PLA



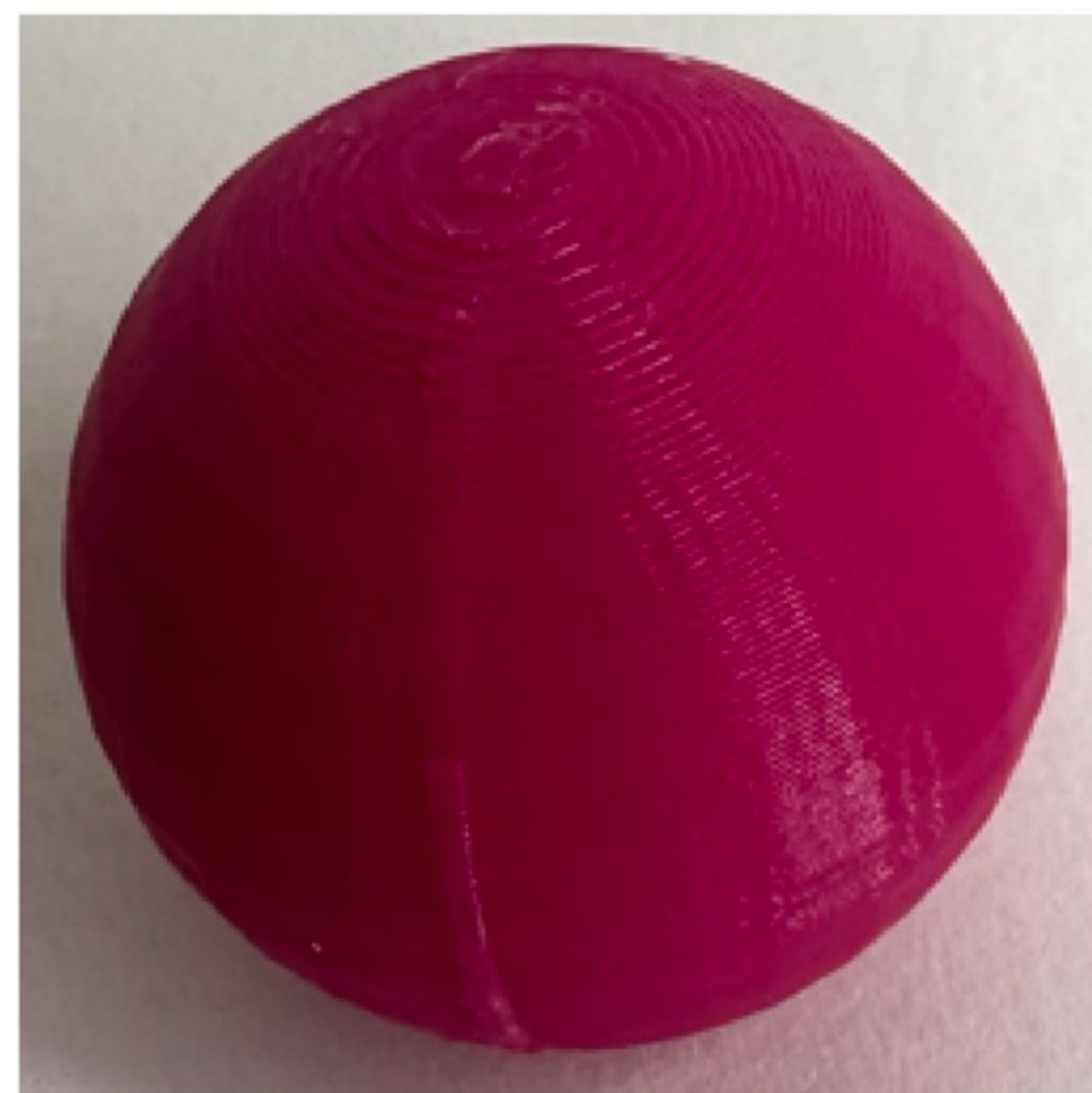
And users are **left to guess** how their prints will turn out:



**Target**



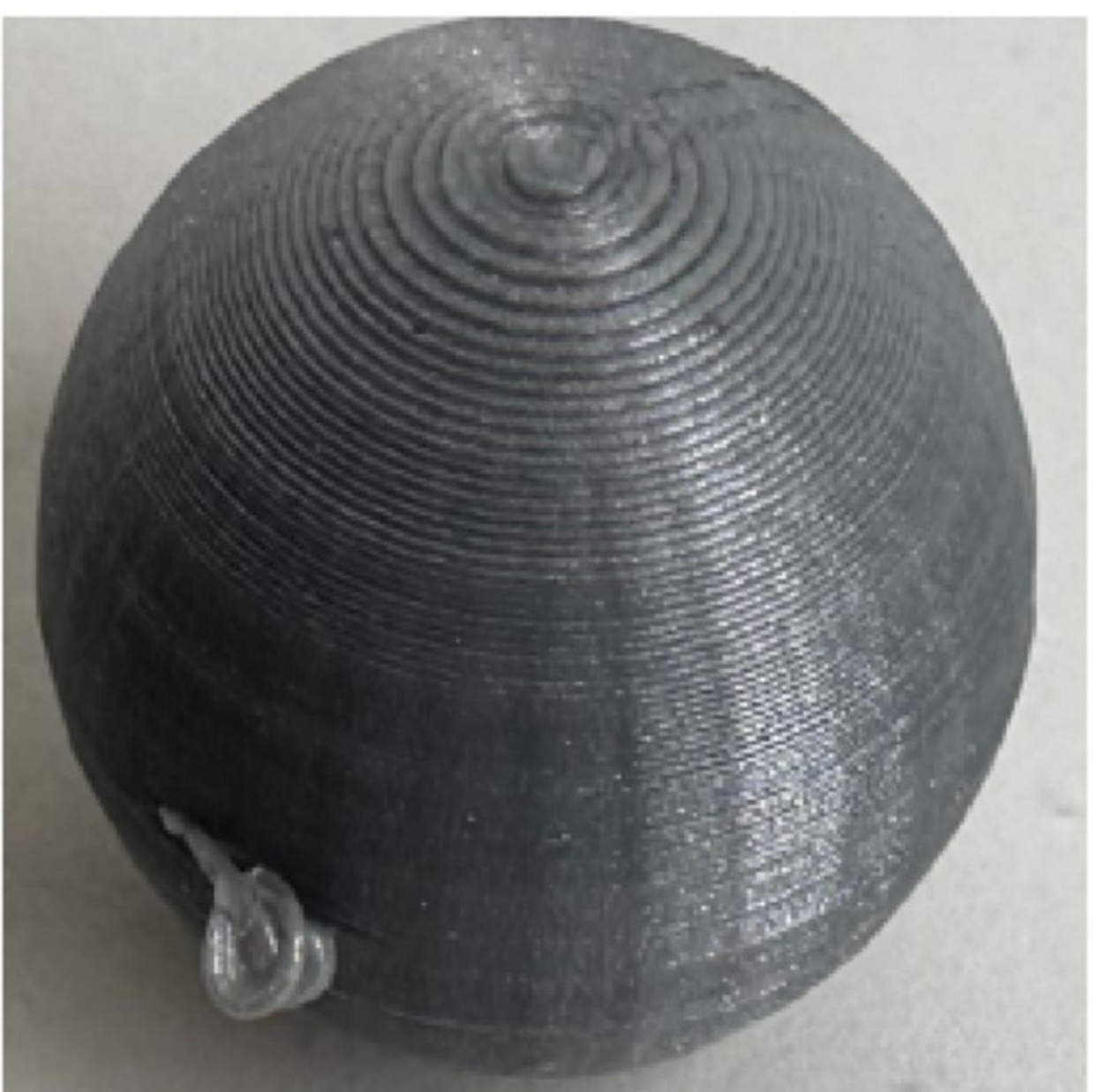
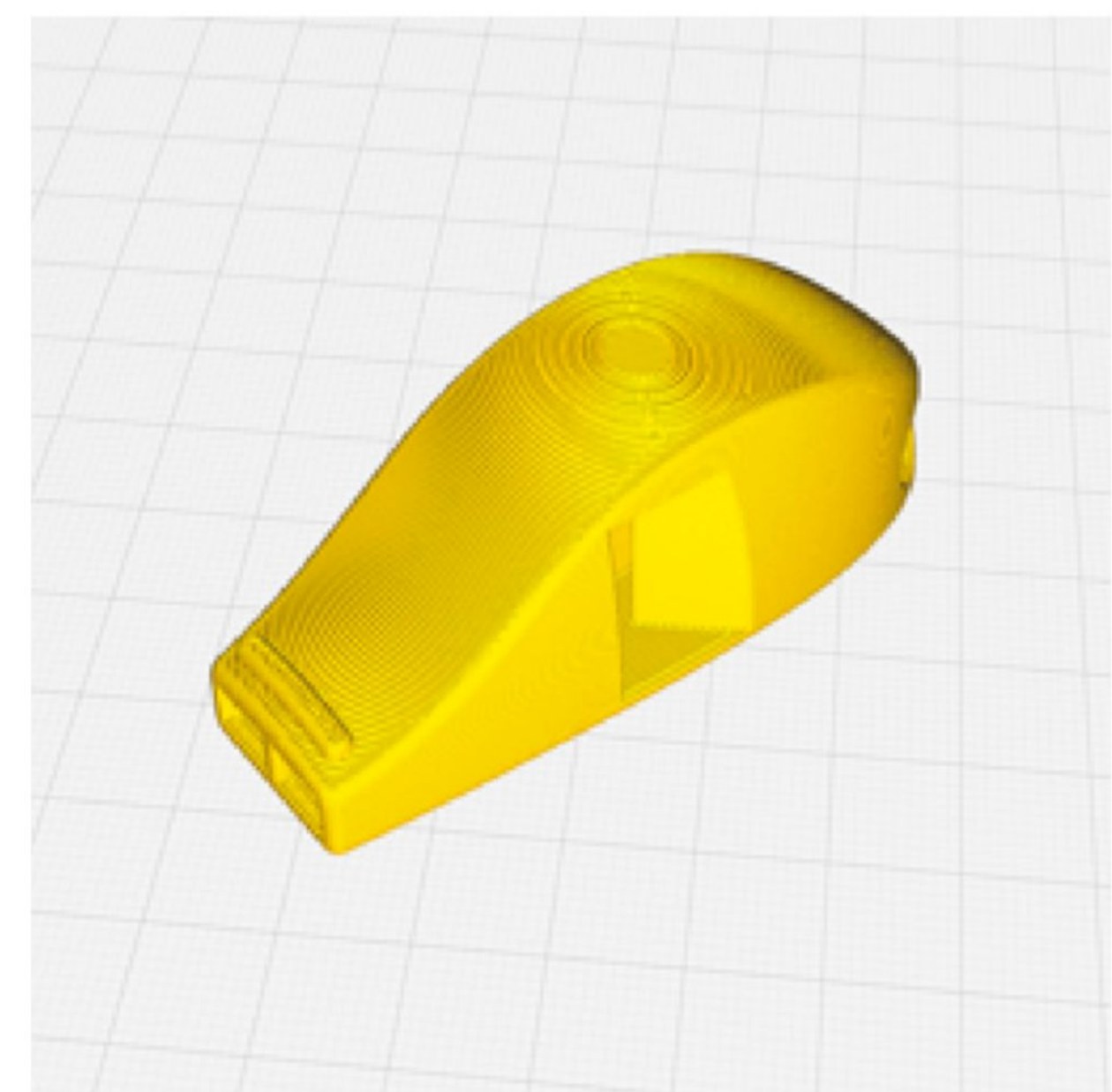
**Material**



**Real Photo**

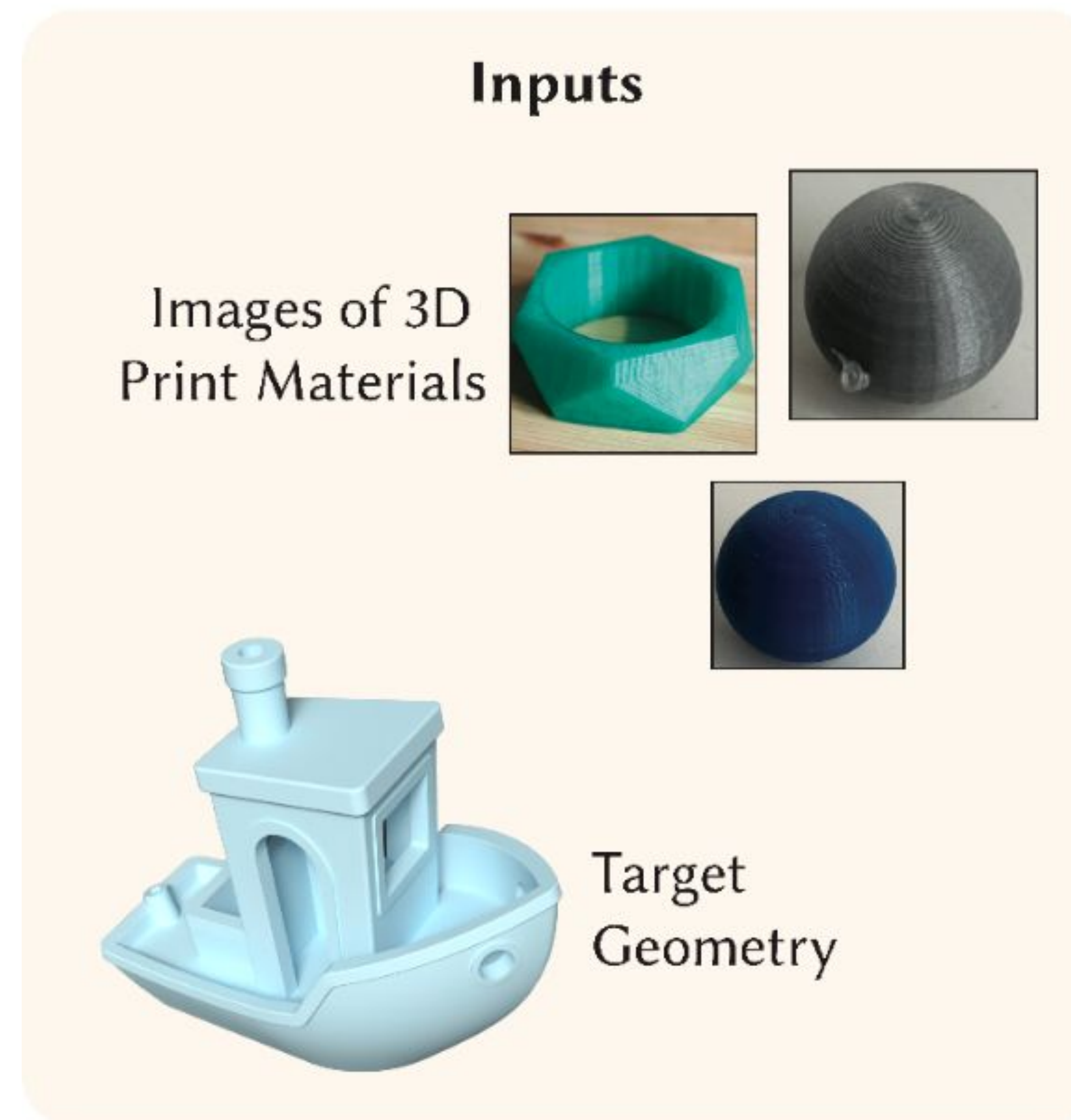


**VisiPrint (ours)**

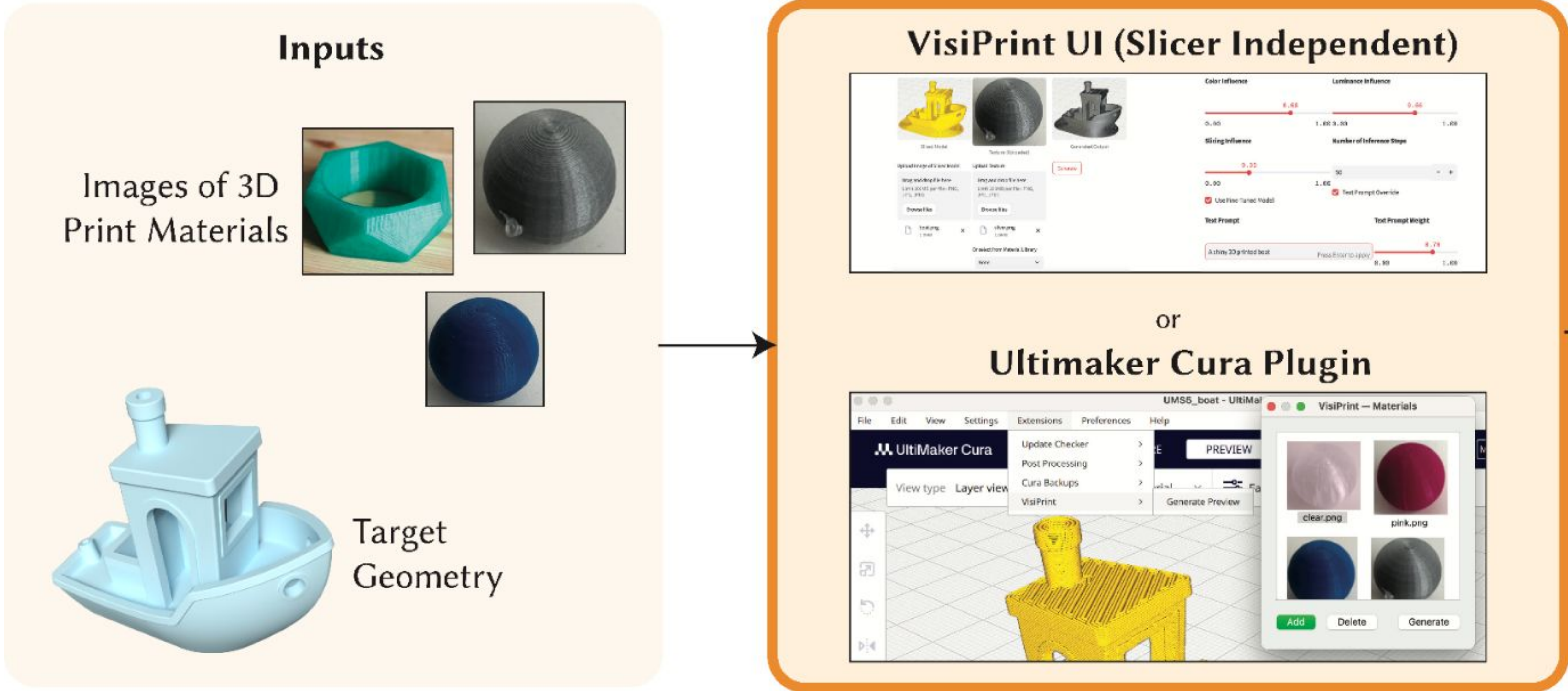


# System Overview

# VisiPrint System Overview



# VisiPrint System Overview



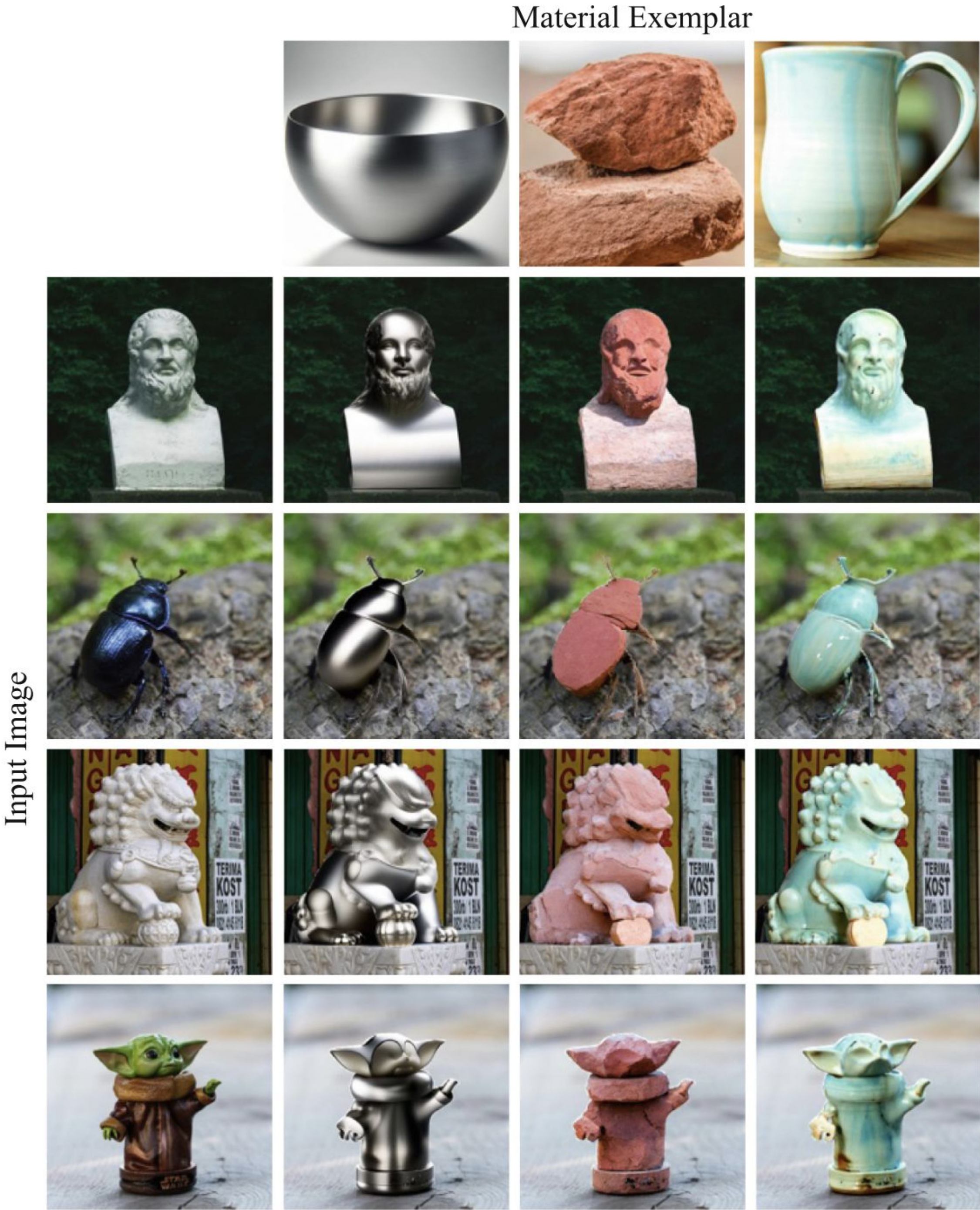
# VisiPrint System Overview



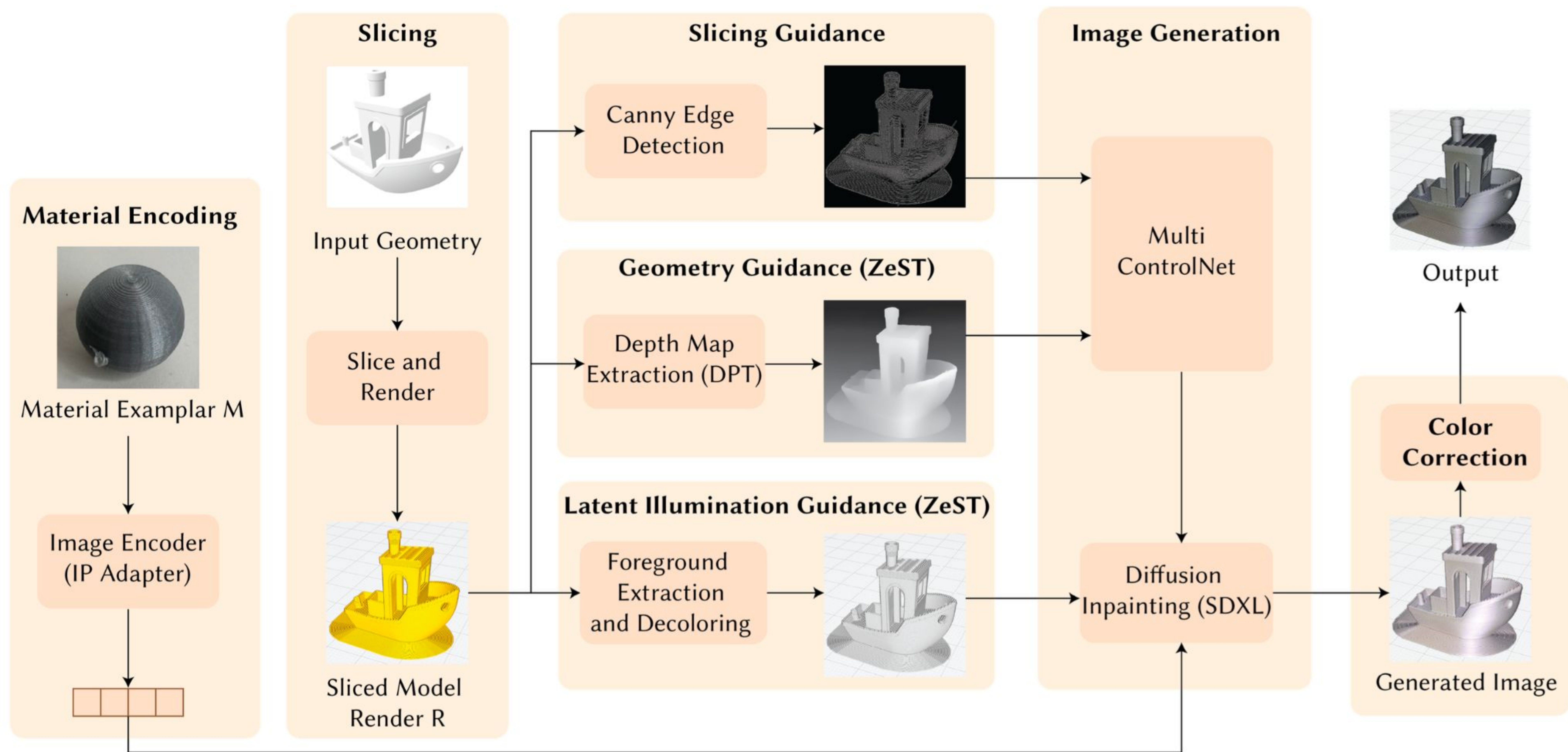
# Method

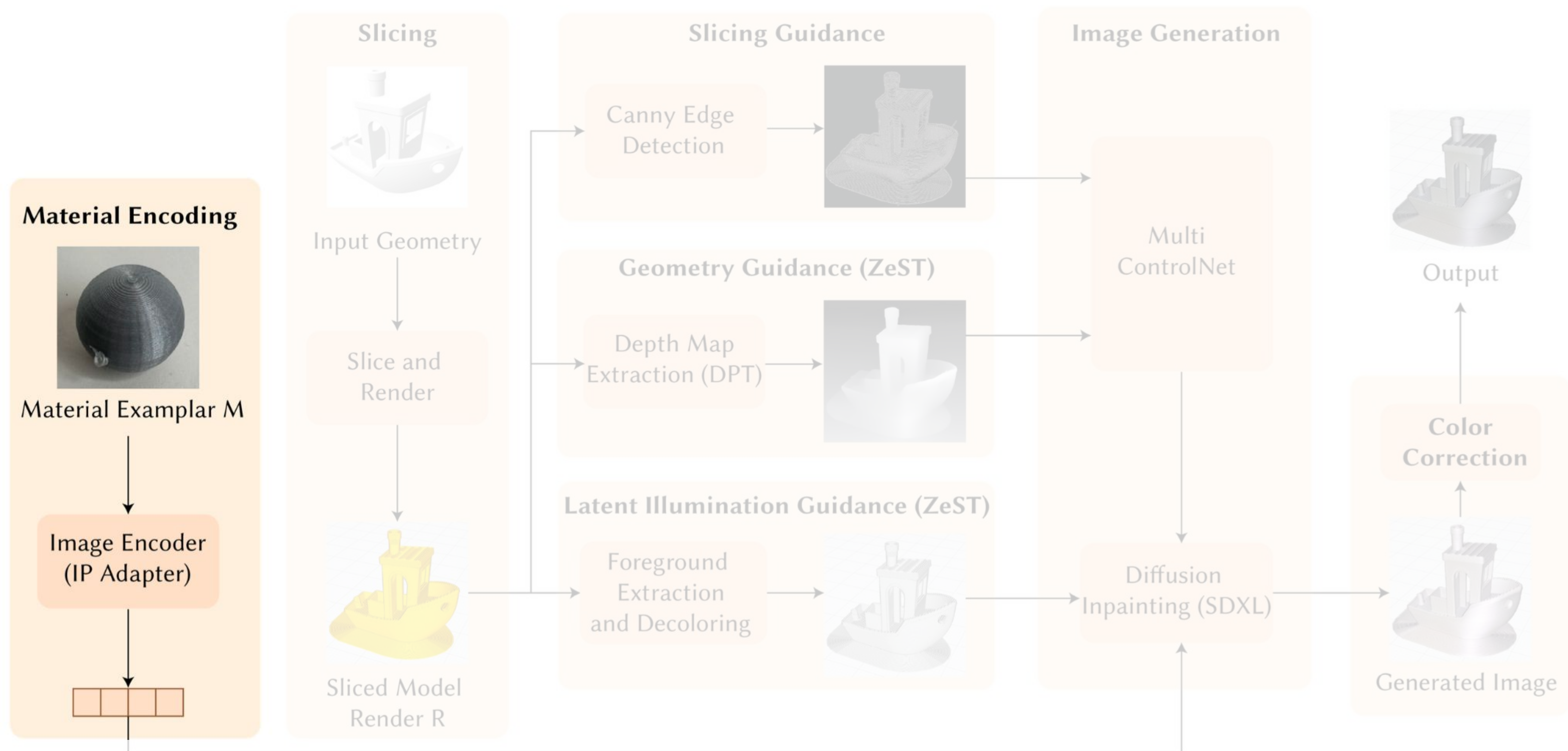
# ZeST: Zero-Shot Material Transfer from a Single Image, ECCV, 2024

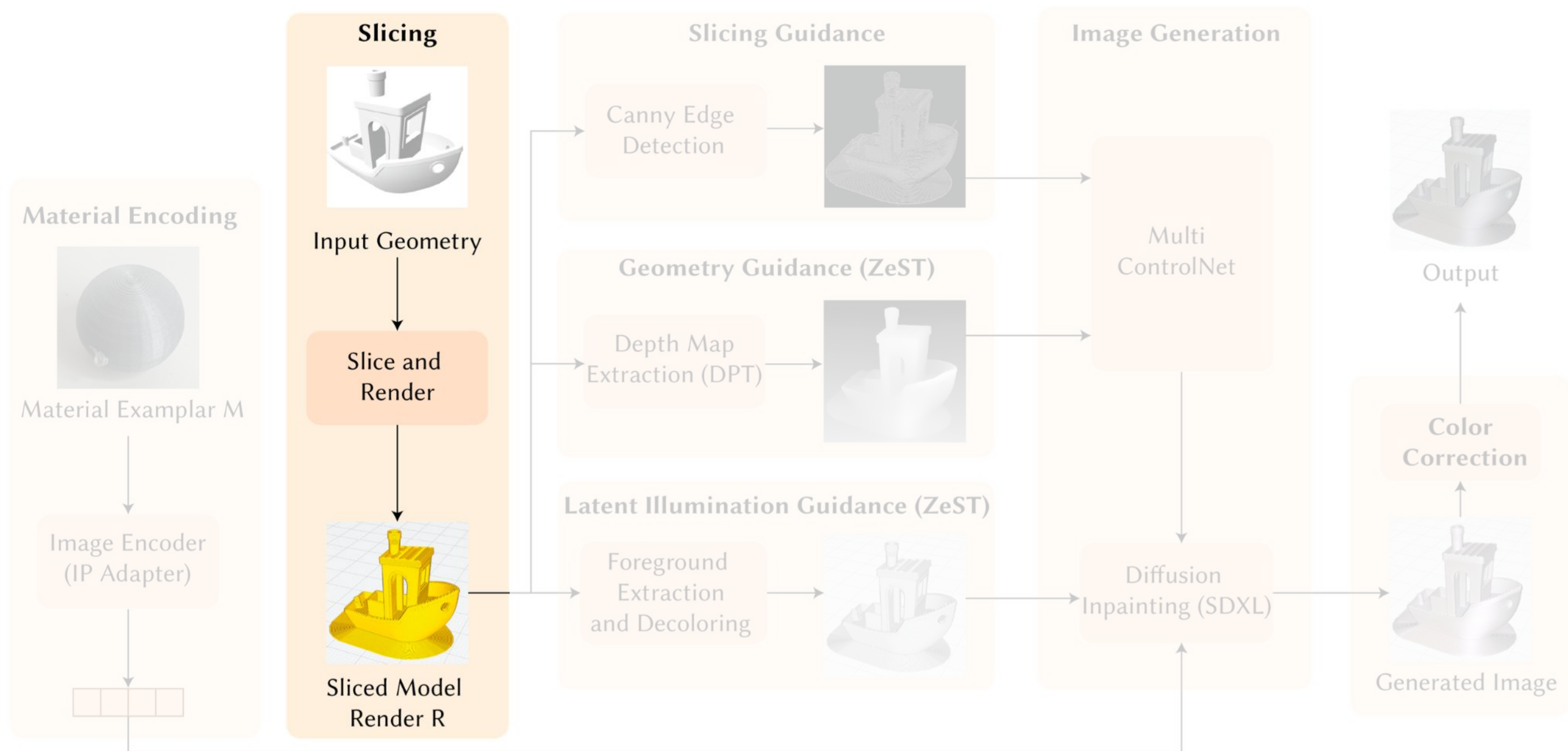
Ta-Ying Cheng<sup>1,2</sup>, Prafull Sharma<sup>3</sup>, Andrew Markham<sup>1</sup>, Niki Trigoni<sup>1</sup>, Varun Jampani<sup>2</sup>  
<sup>1</sup> University of Oxford, <sup>2</sup> Stability AI, <sup>3</sup> MIT CSAIL

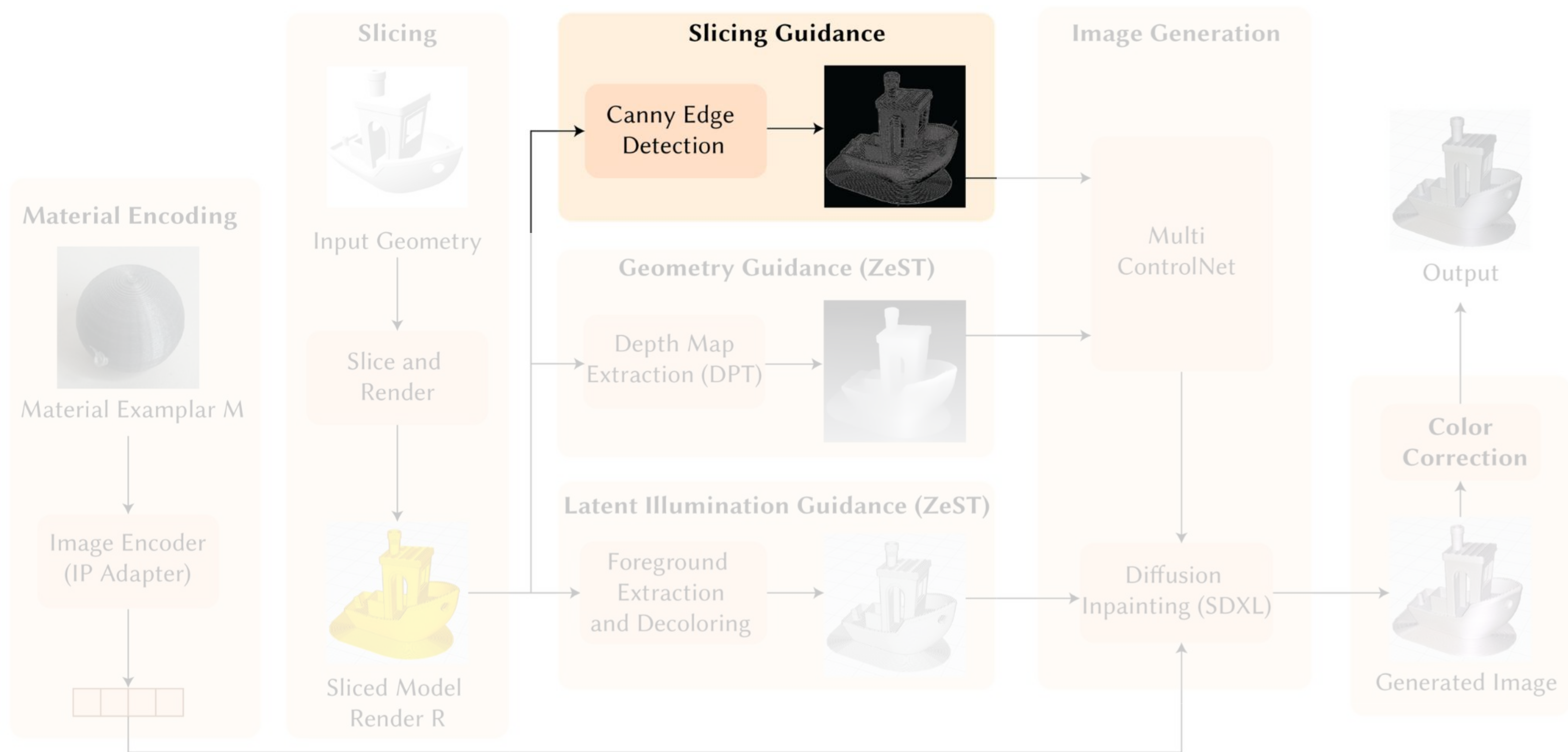


(a) Zero-shot Material Transfer

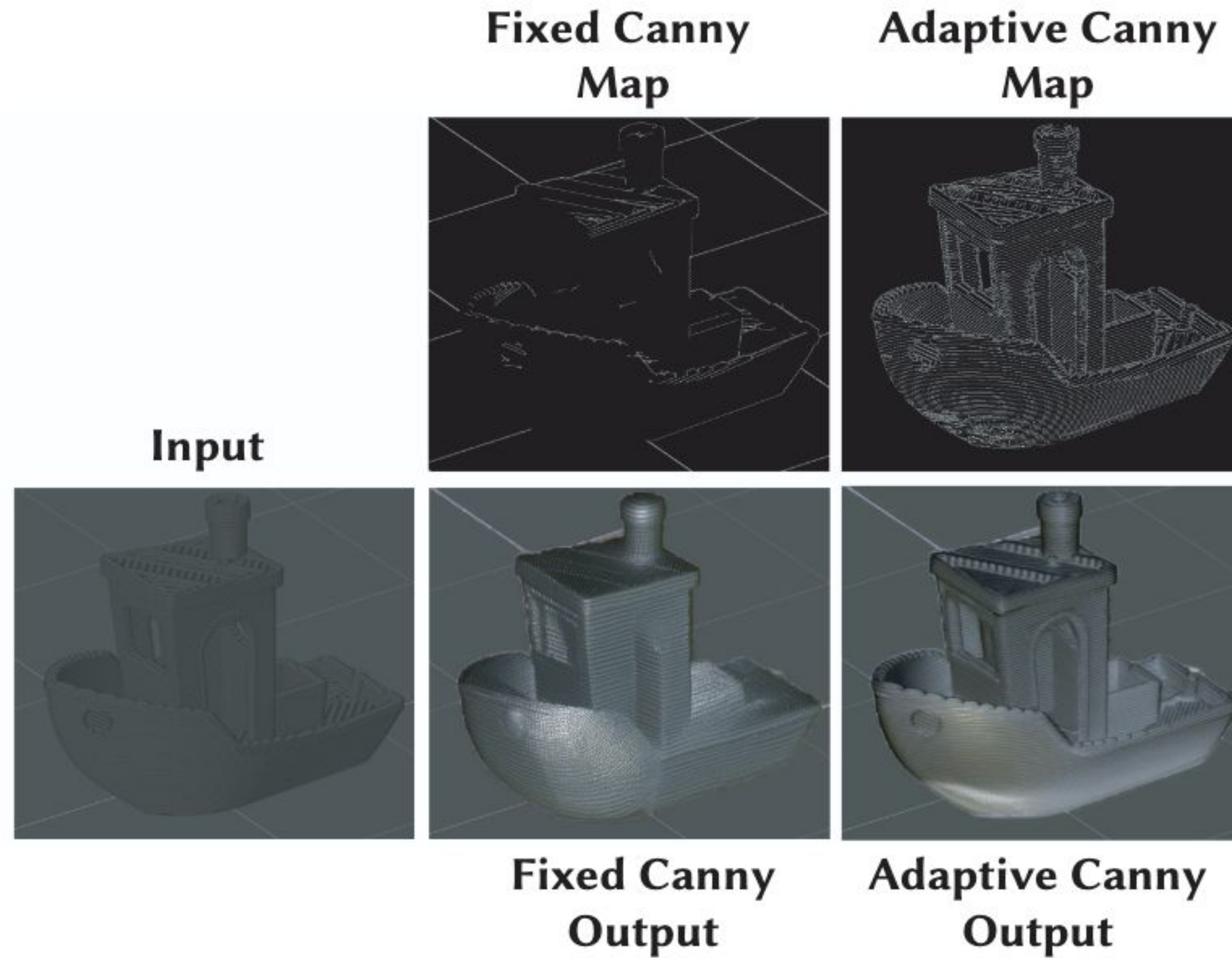


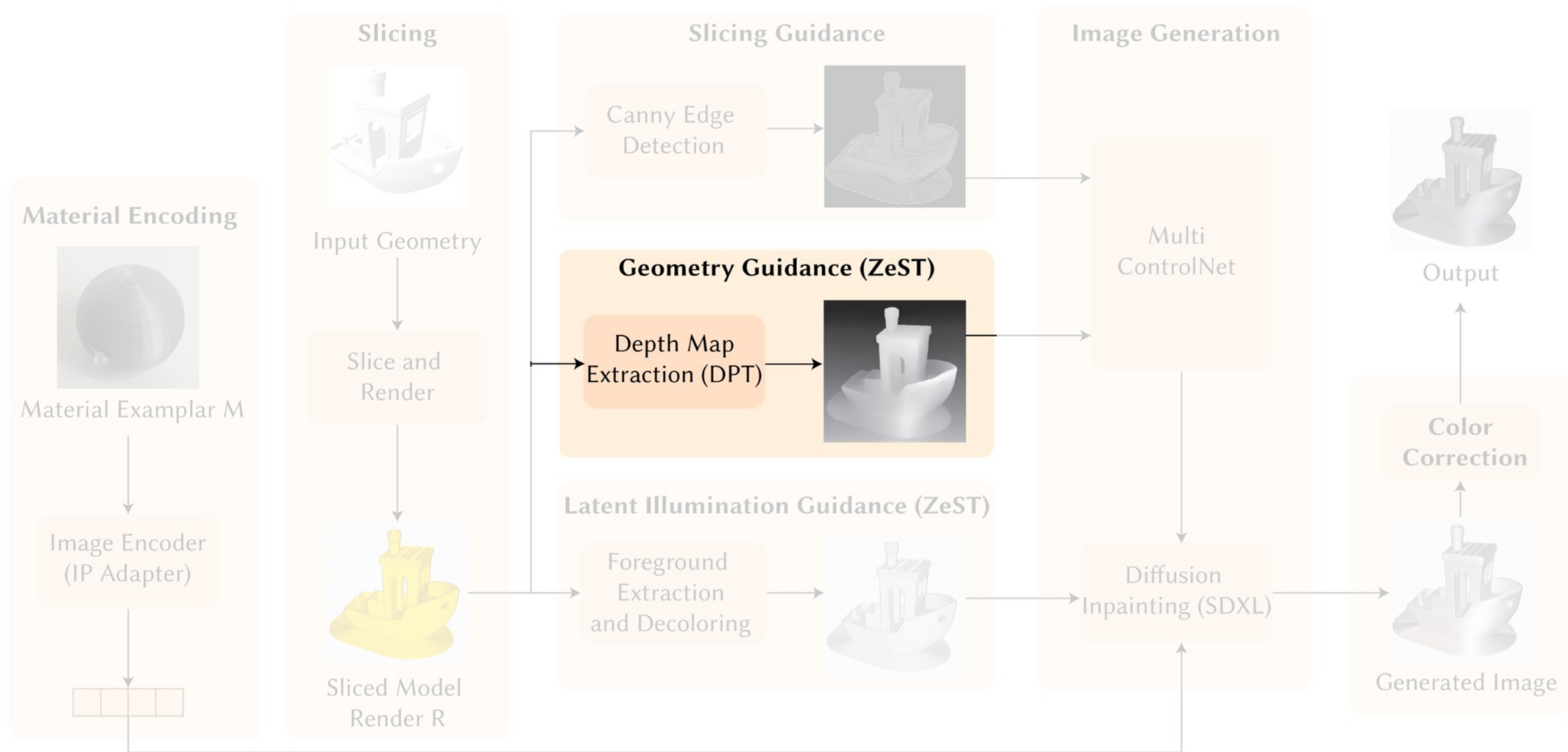


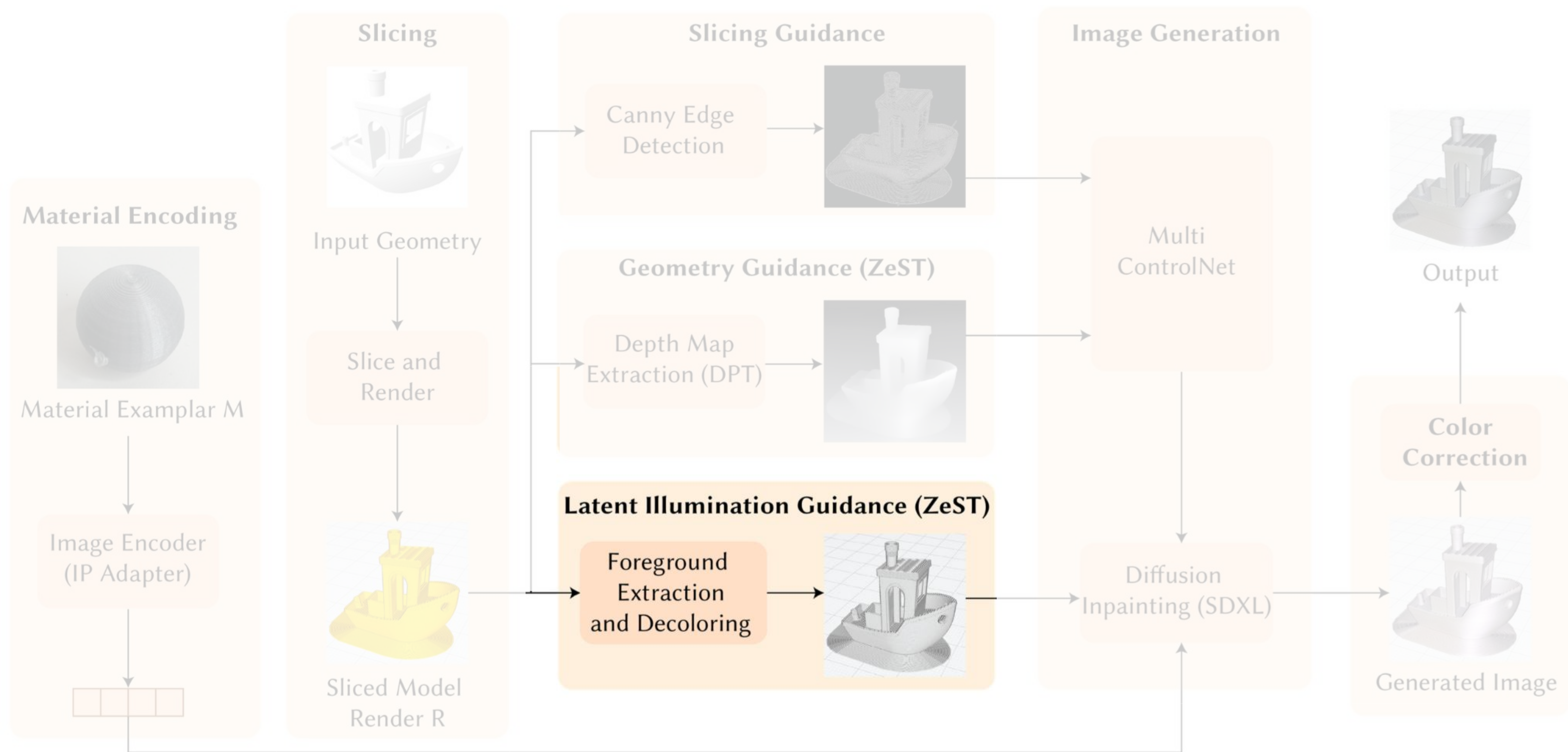


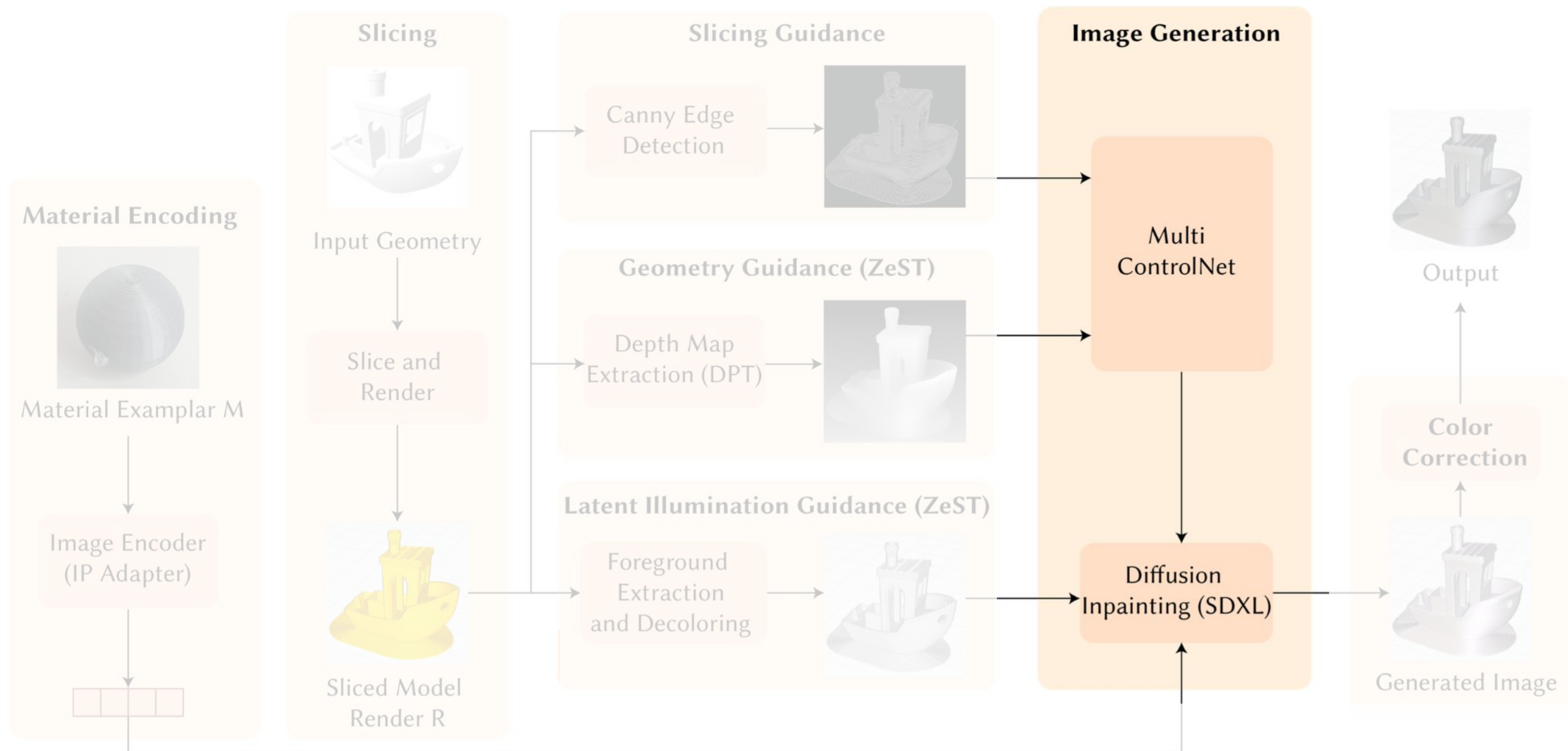


# Canny Edge Extraction

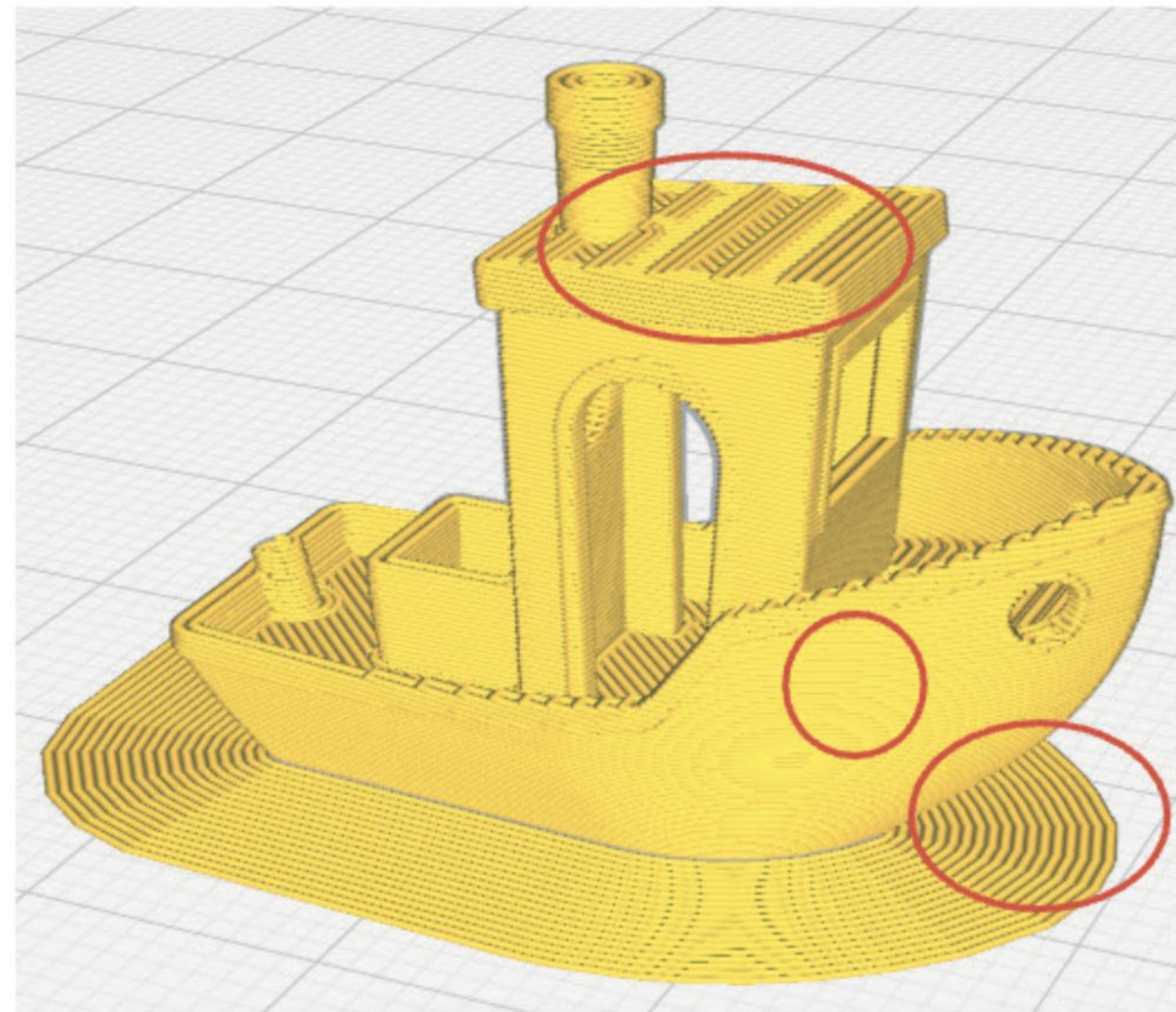




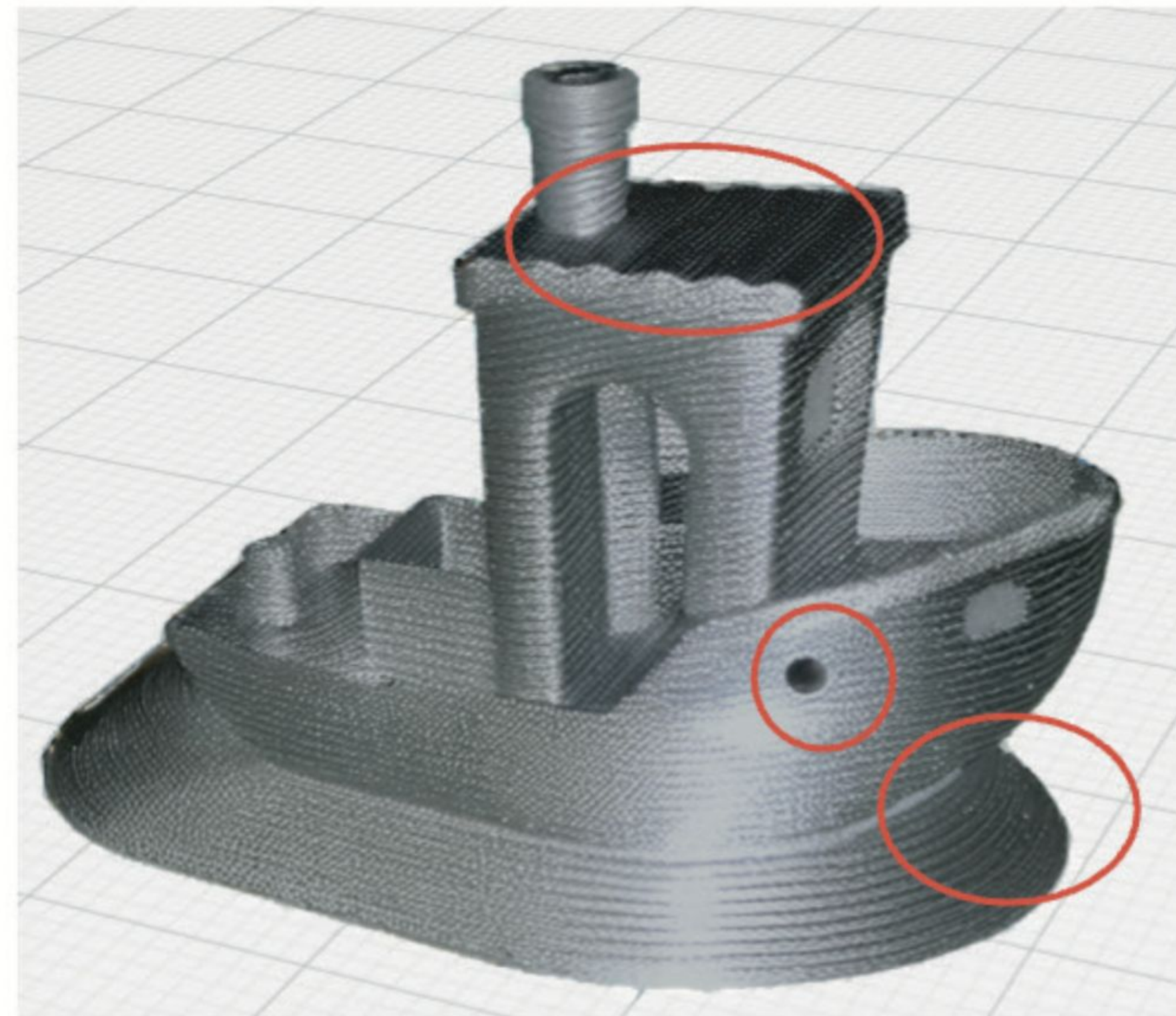




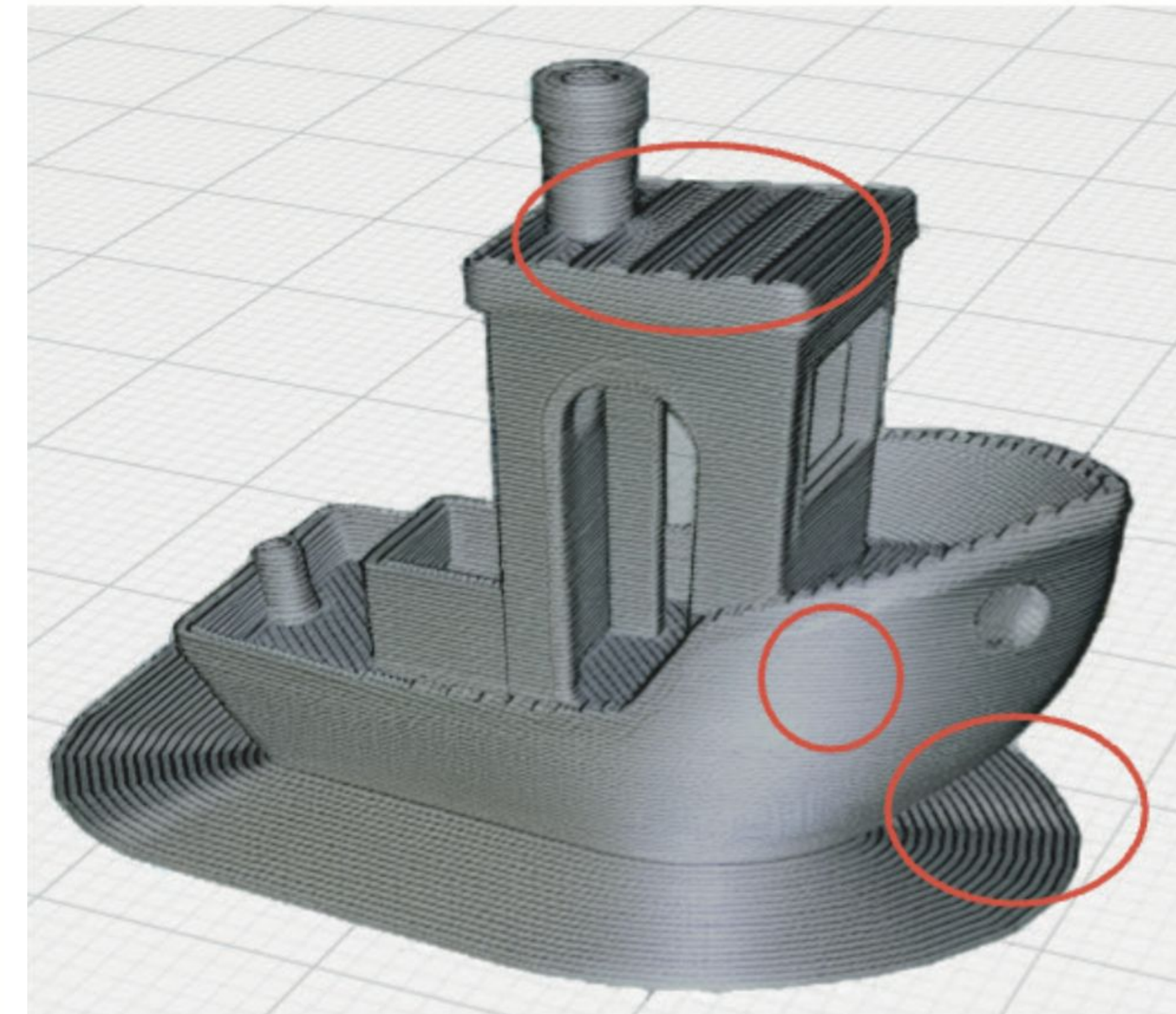
**Input**



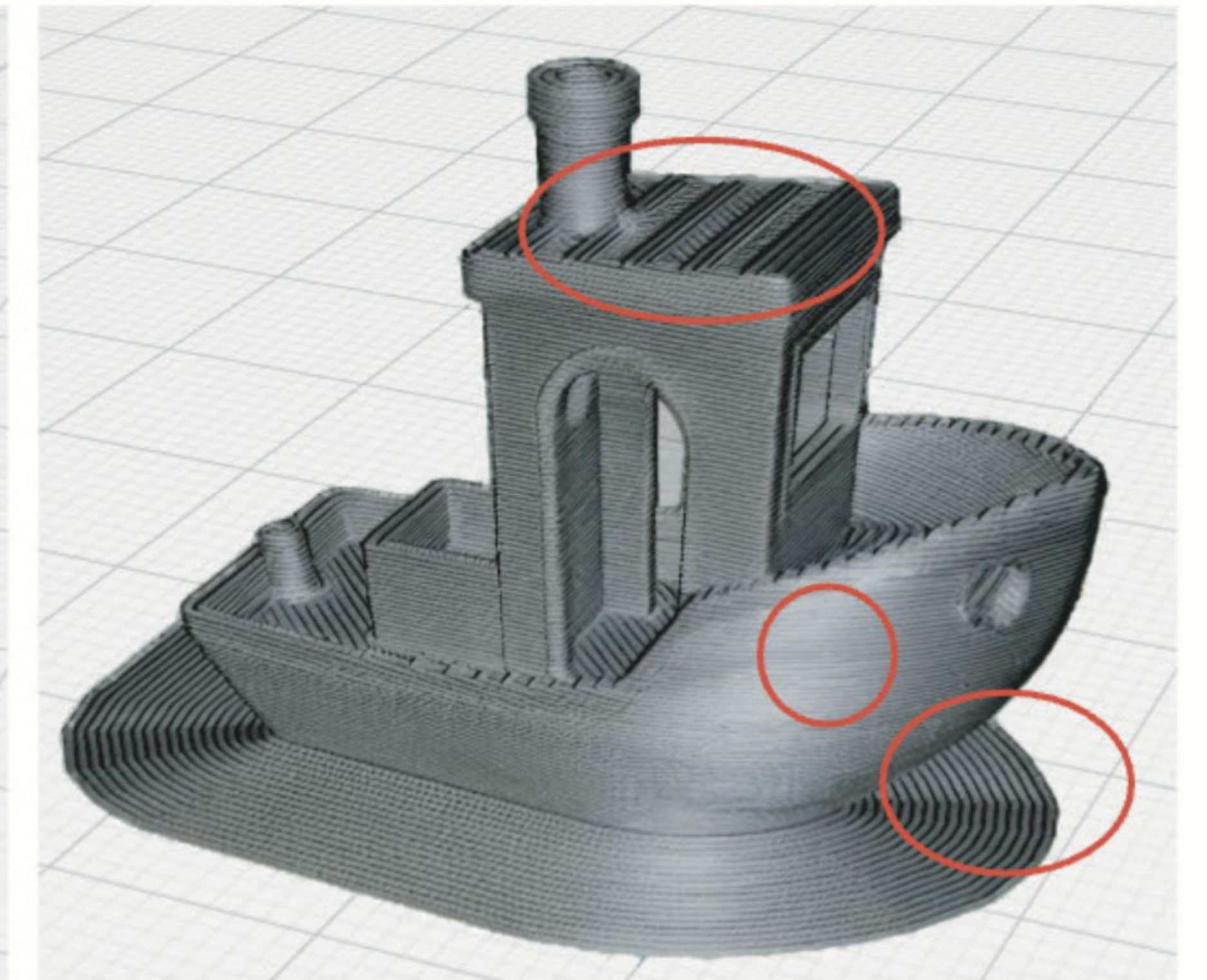
**Conditioned on  
Depth Map**

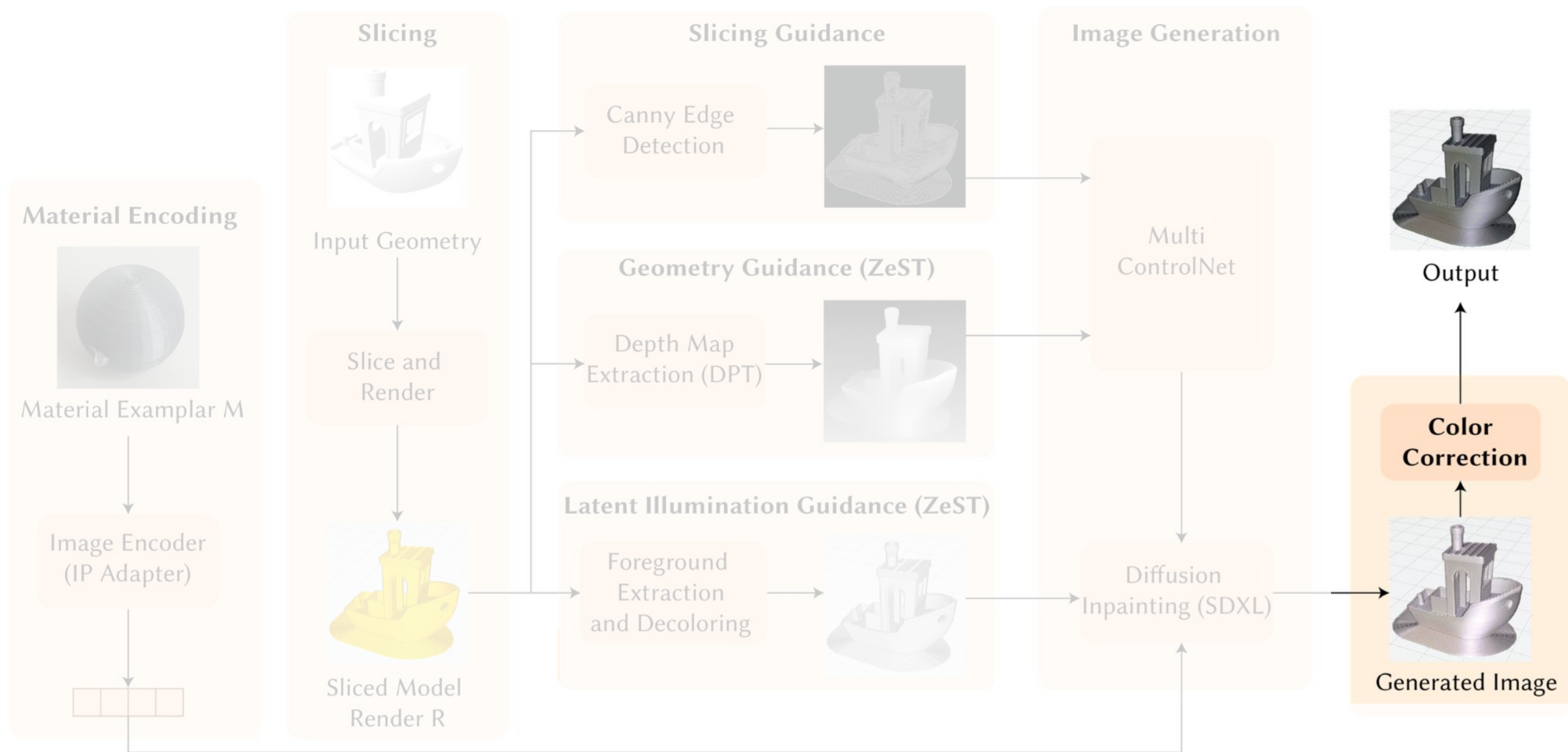


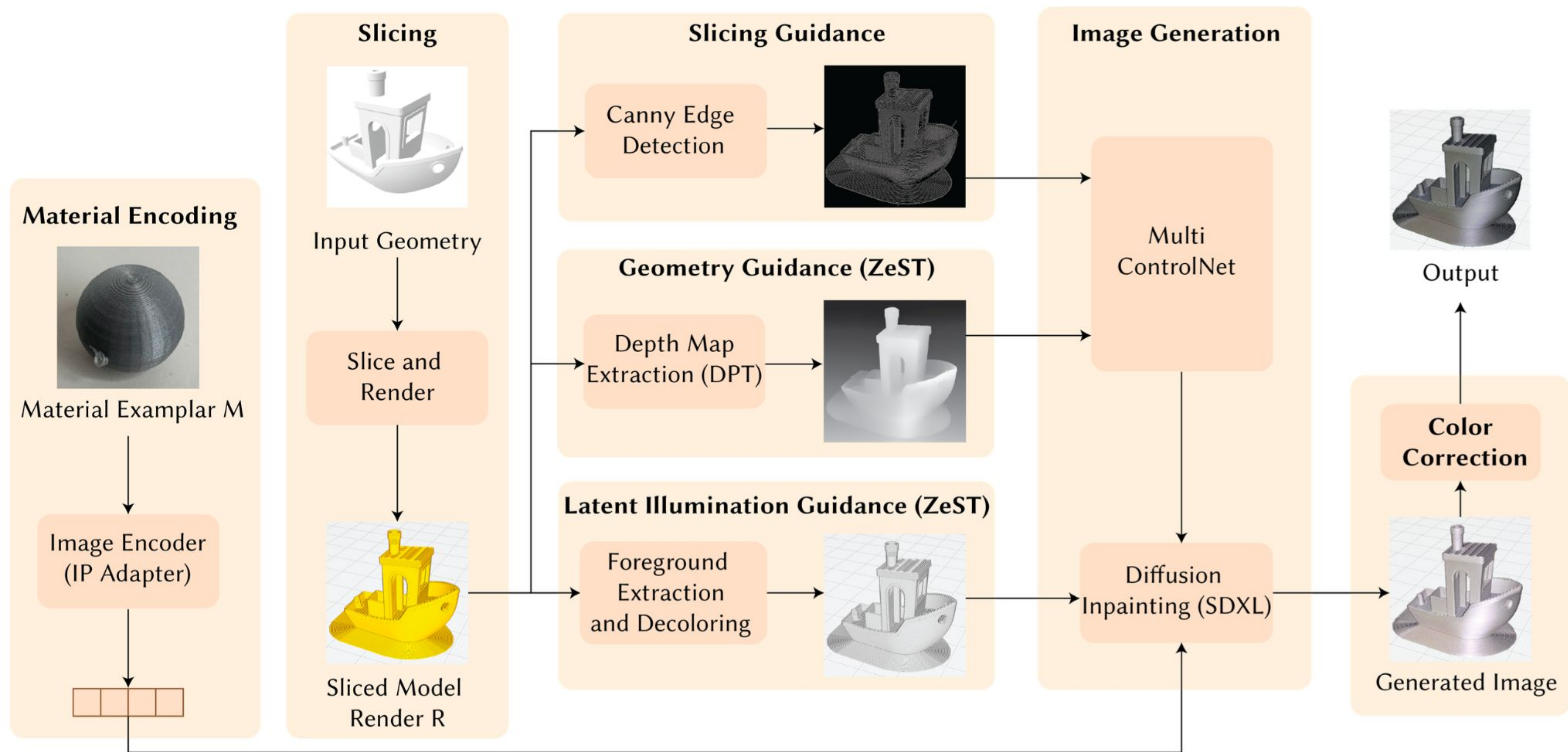
**Conditioned on  
Canny + Depth**



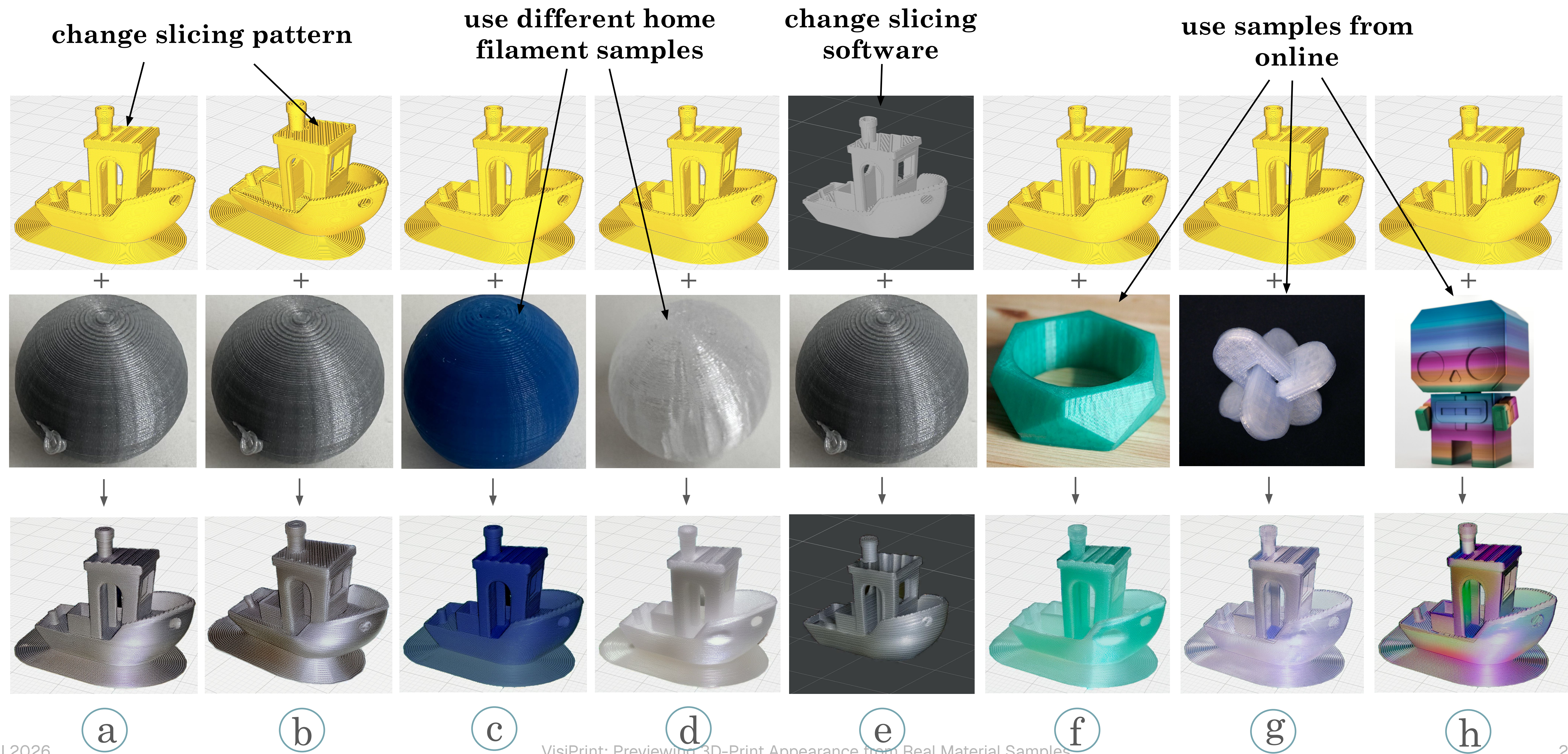
**Conditioned on  
Canny Edges**







# Supporting informed decision making when 3D printing



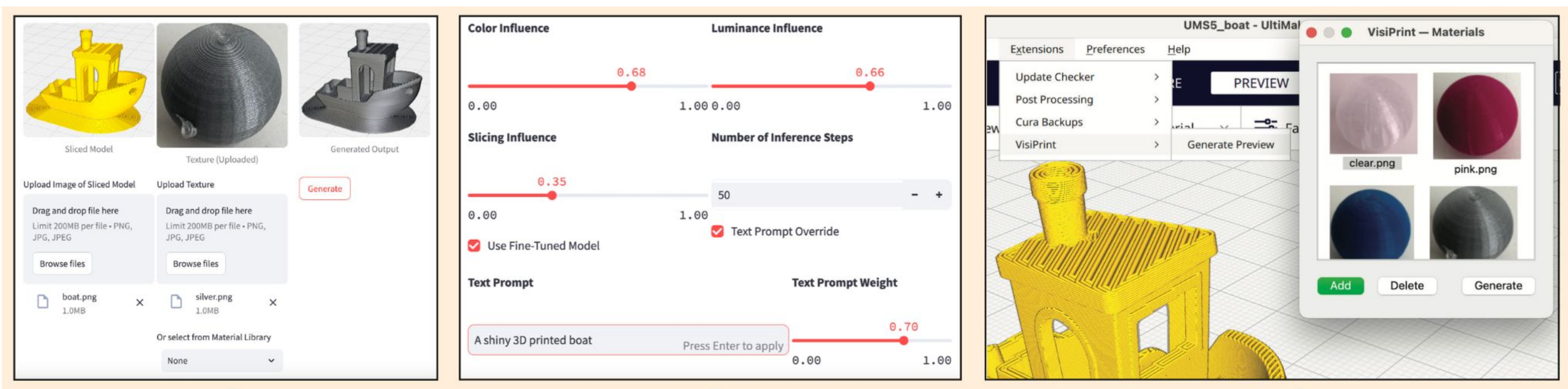
# User Interface

# VisiPrint User Interface

## User Inputs

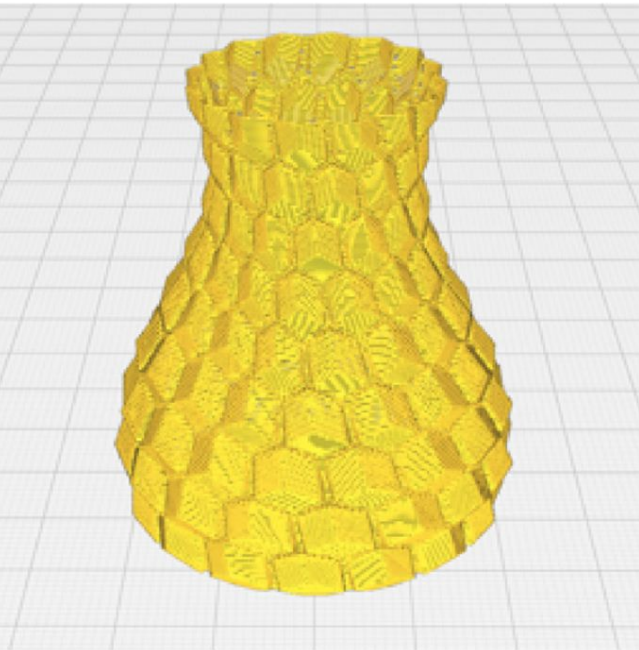
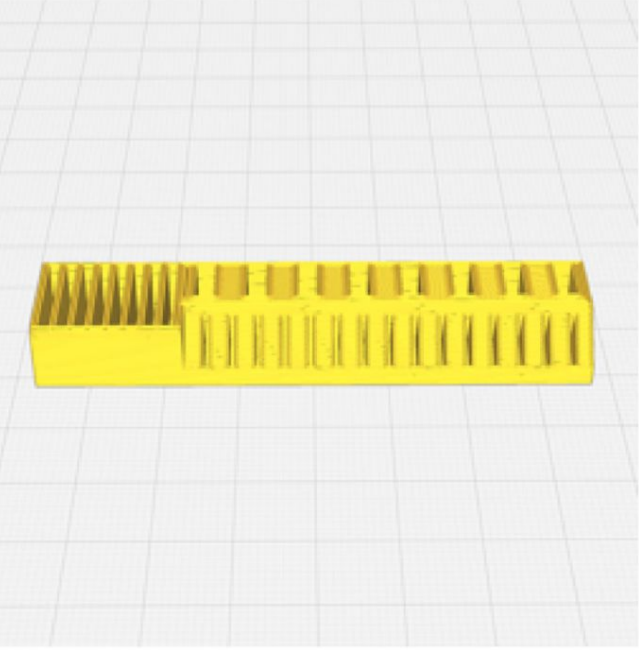
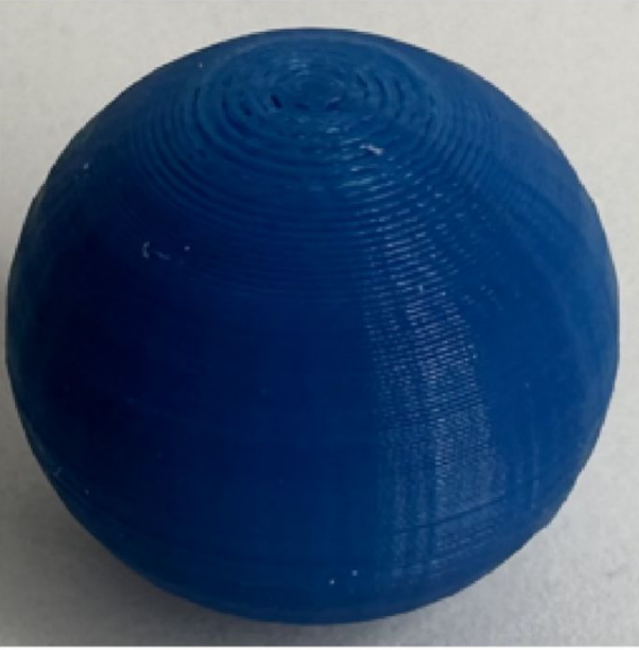
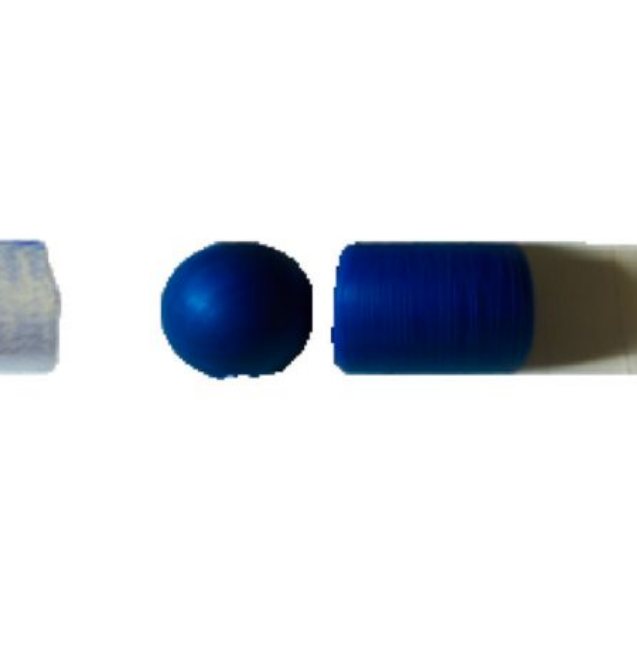
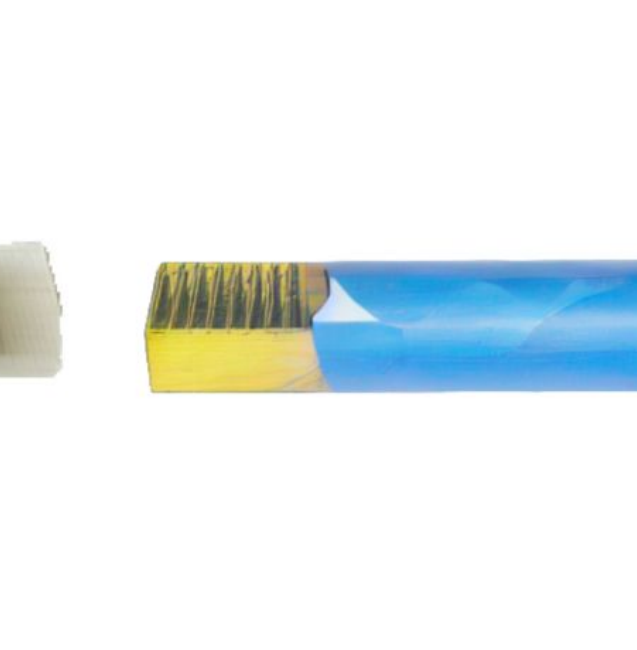
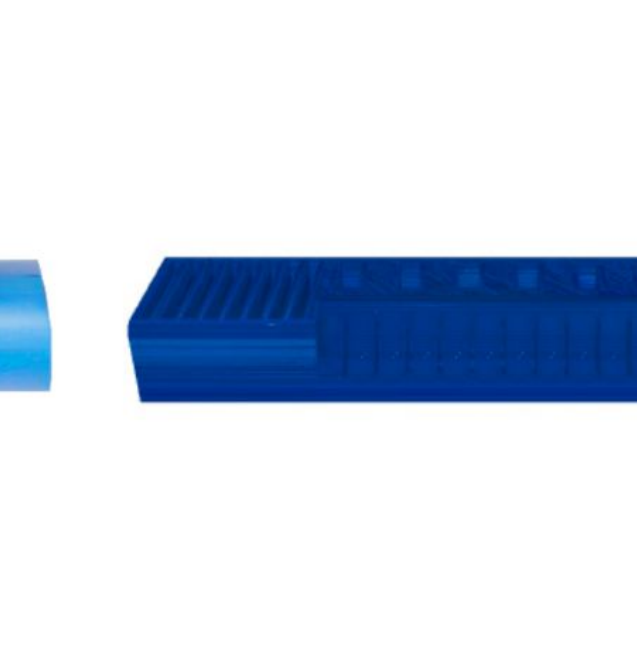
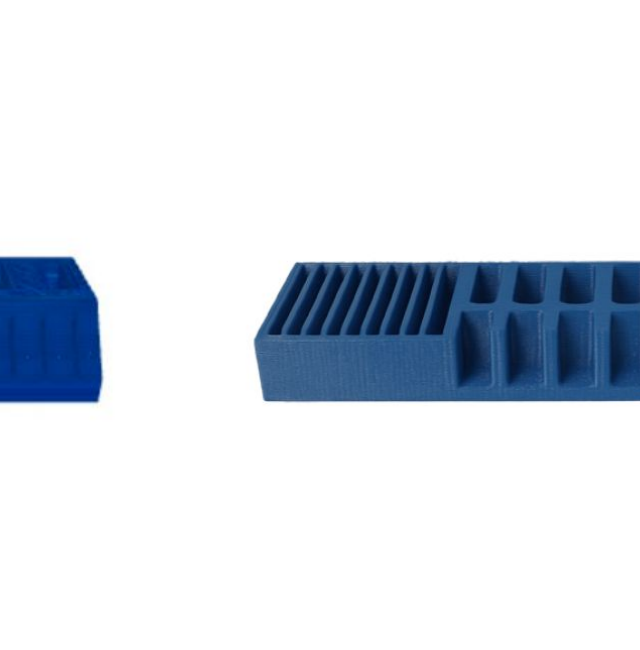
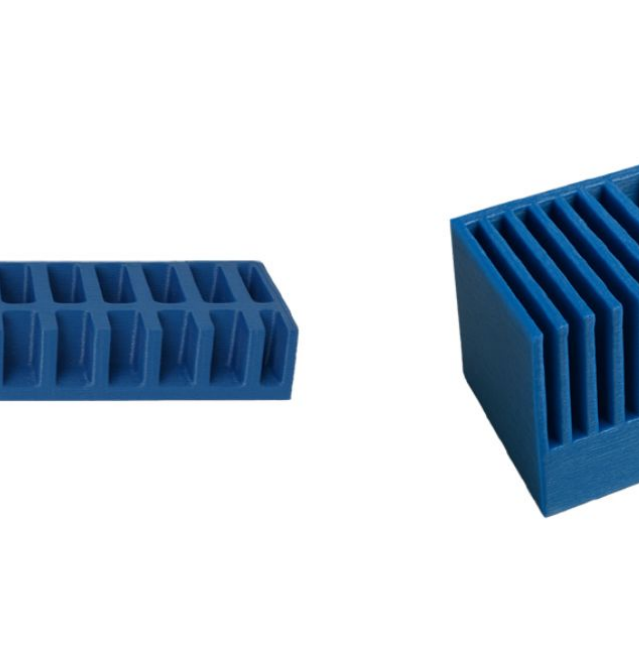
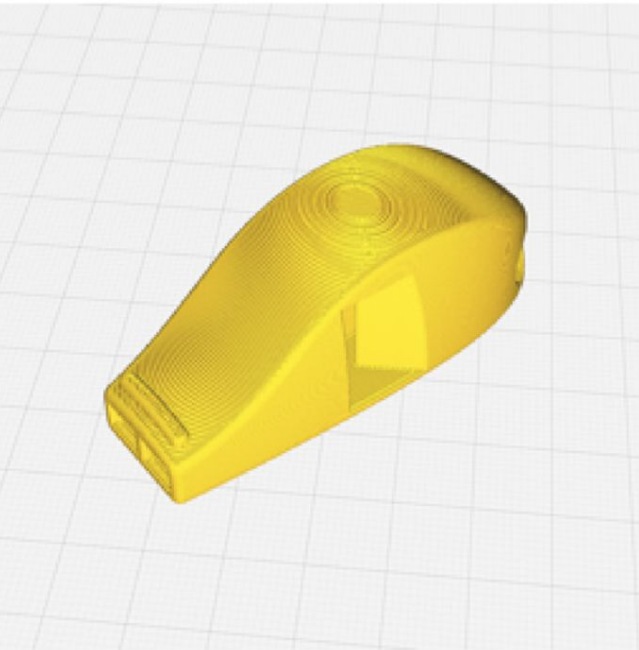
## Preview + Controls

## Plugin

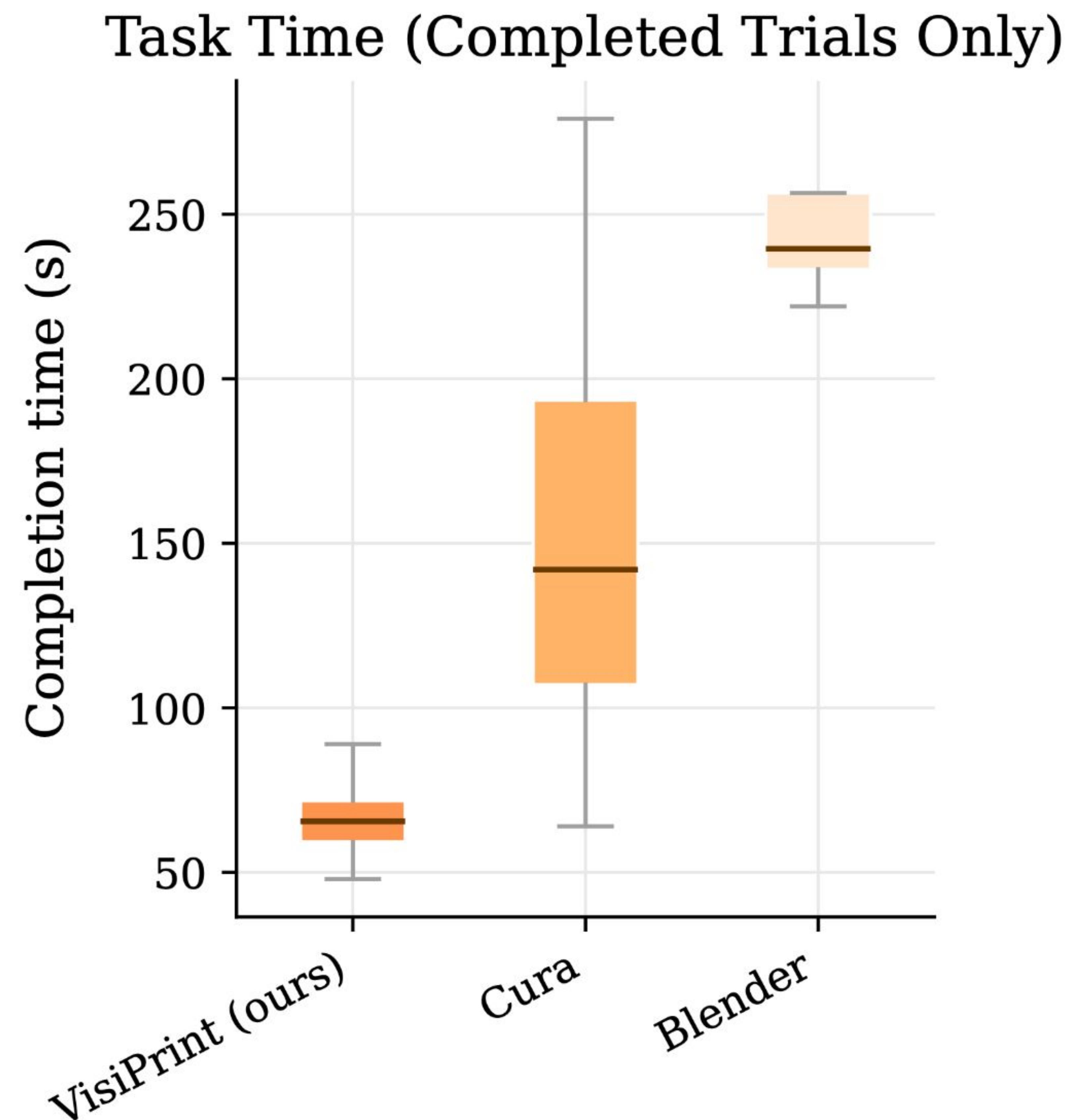
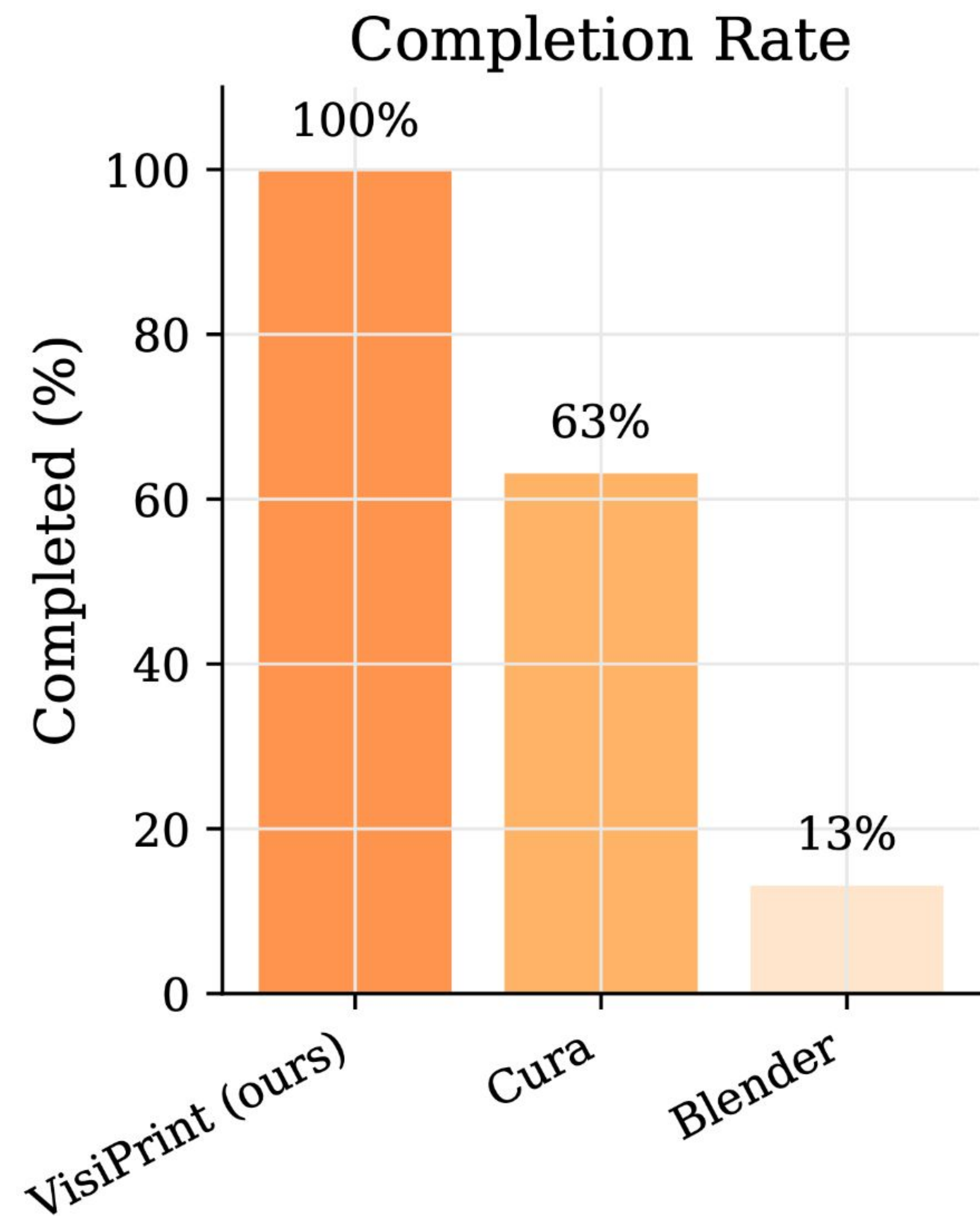


# Evaluation

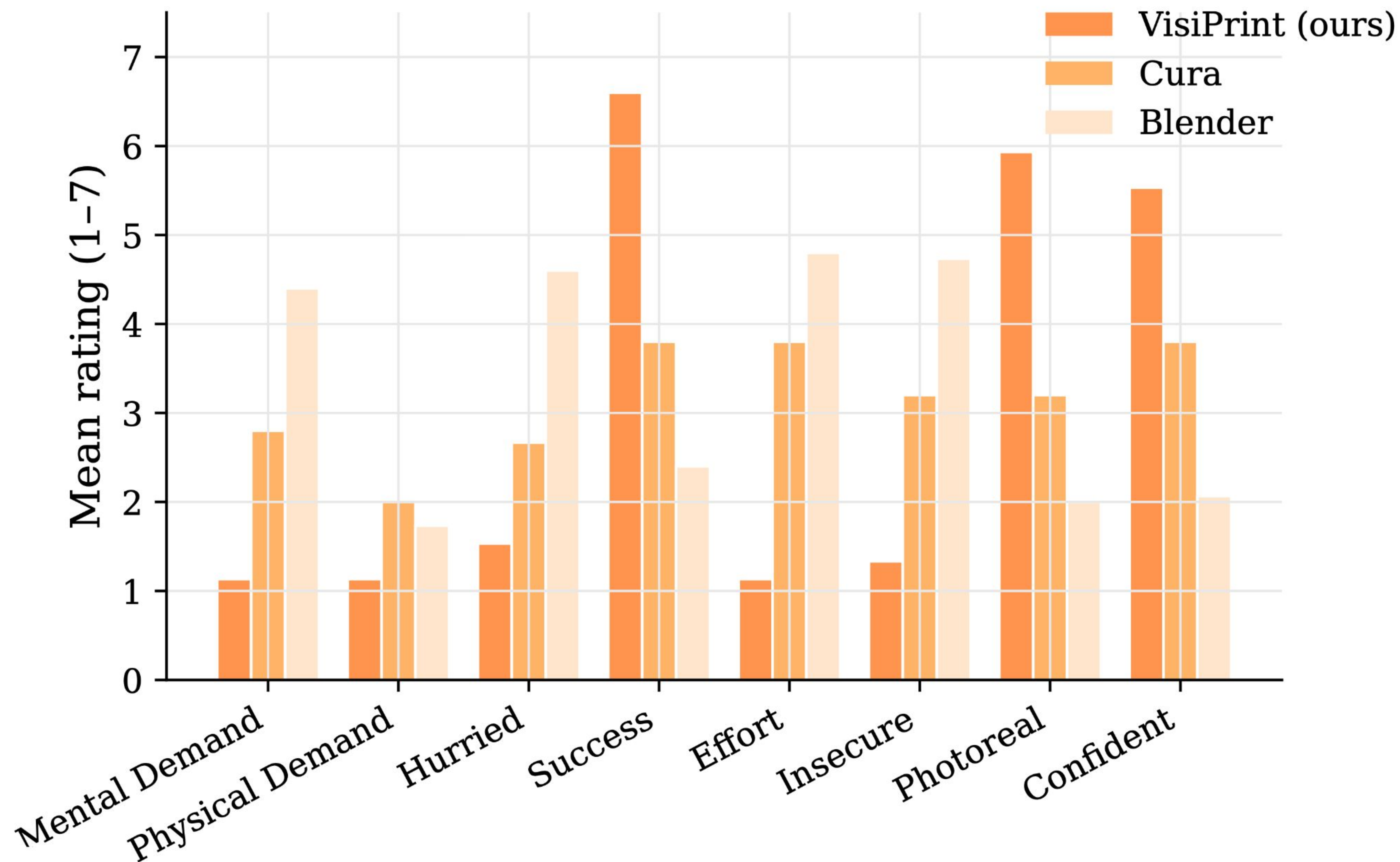
# Baselines

| Target                                                                             | Material                                                                            | Real Photo                                                                          | VisiPrint (ours)                                                                     | ZeST                                                                                  | IP-Adapter                                                                            | MatSwap                                                                               | SVBRDF                                                                                | GPT-5 (Attempt 1)                                                                     | GPT-5 (Attempt 2)                                                                     |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |    |    |    |    |    |    |    |    |    |
|   |   |   |   |   |   |   |   |   |   |
|  |  |  |  |  |  |  |  |  |  |

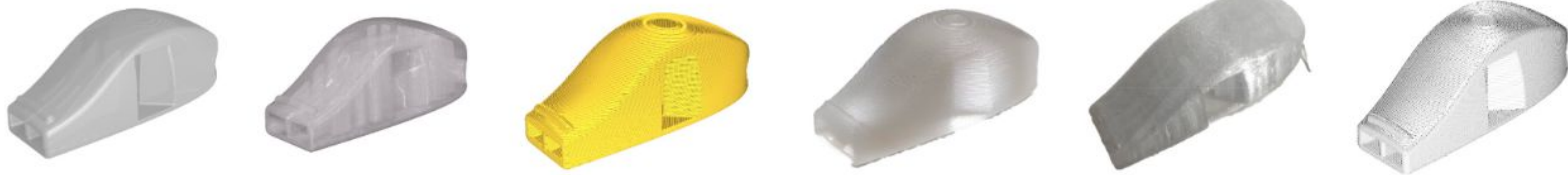
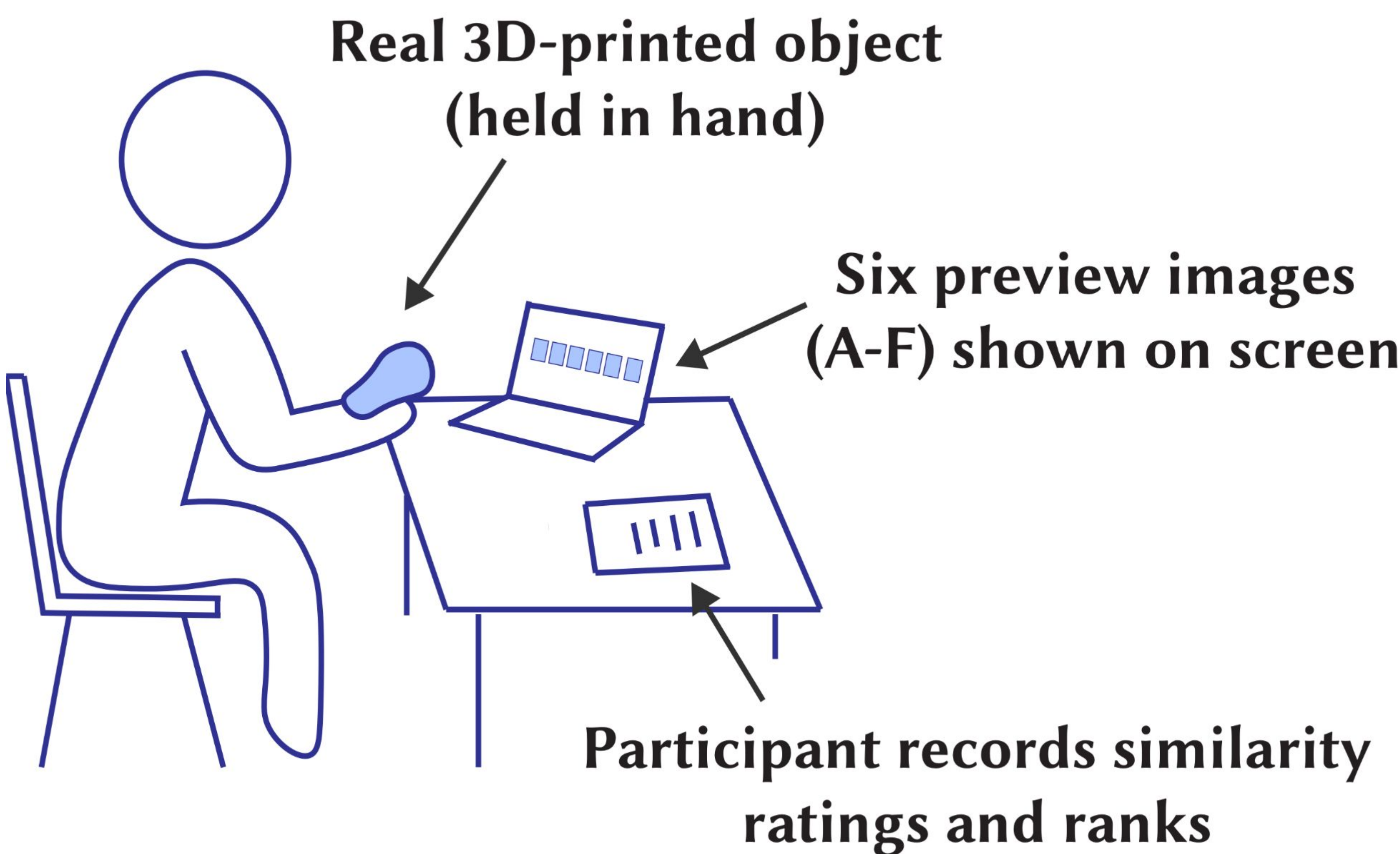
# User Study - Results



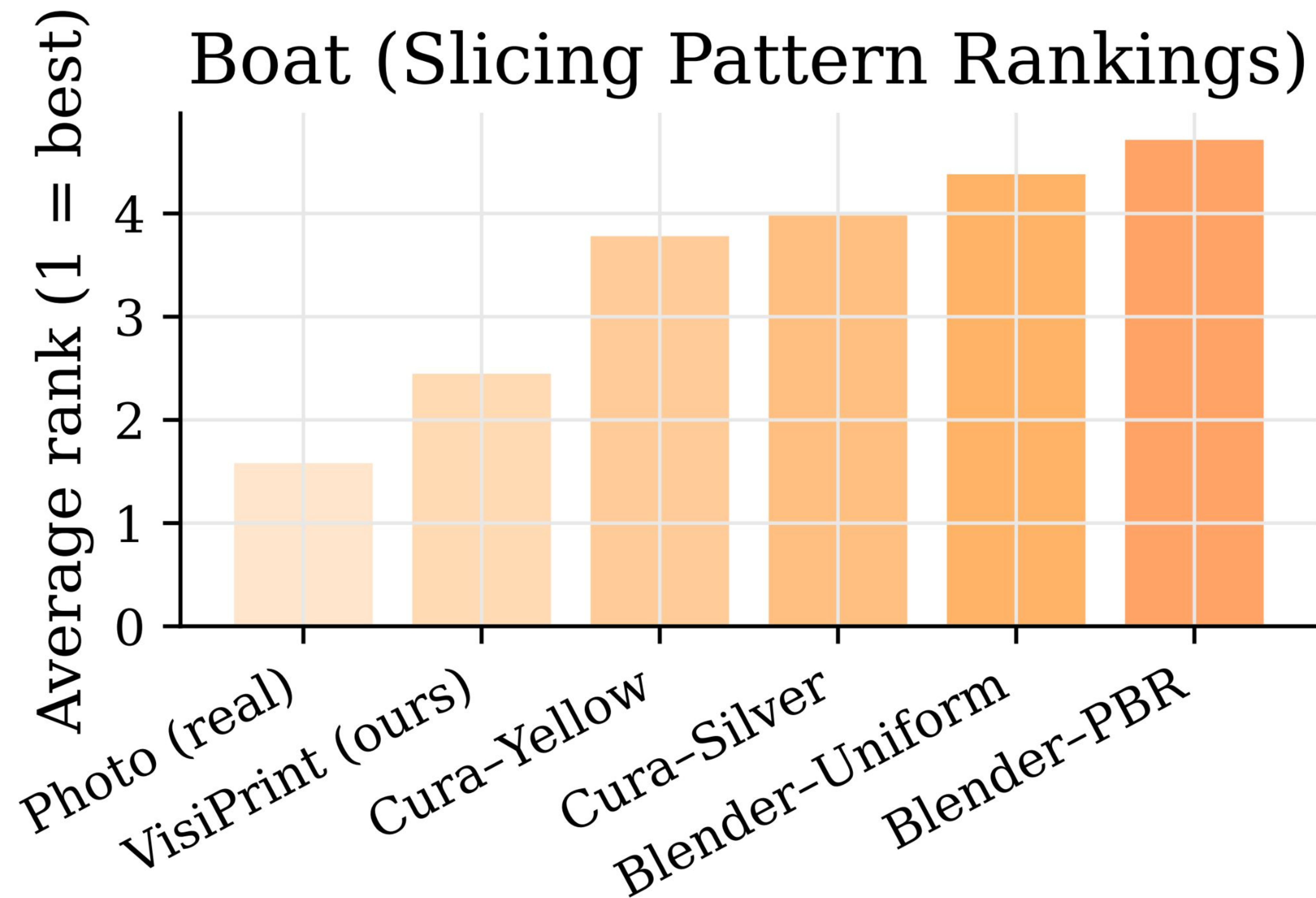
# User Study - Results



# Perception Test



# Perception Test - Results



# Limitations and Future Work

## Limitations

- Depends on exemplar lighting; no arbitrary relighting
- Single view; artifacts in hollow/detailed regions
- Not a printability predictor but rather complements slicer validation

## Next Steps

- Multi-view/orbiting previews and multimaterial prints
- Broader materials (e.g. holo, view dependent)
- Other fabrication technologies

# Thank you for listening!

**VisiPrint:**  
Previewing 3D-Print Appearances from  
Real Material Samples

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Faraz Faruqi<sup>1</sup>  
Sooyeon Ahn<sup>2</sup>  
Raul Eduardo Hernandez<sup>1</sup>  
Szymon Rusinkiewicz<sup>3</sup>  
William Freeman<sup>1</sup>  
Stefanie Mueller<sup>1</sup>

<sup>1</sup>MIT CSAIL, <sup>2</sup>GIST, <sup>3</sup>Princeton University

