

Probabilistic Reconstruction Networks for 3D Shape Inference from Single Image

— Supplementary Material

Roman Klokov
 roman.klokov@inria.fr
 Jakob Verbeek
 jakob.verbeek@inria.fr
 Edmond Boyer
 edmond.boyer@inria.fr

Univ. Grenoble Alpes, Inria,
 CNRS, Grenoble INP*, LJK
 * Institute of Engineering
 Univ. Grenoble Alpes
 38000 Grenoble, France

In this supplementary material we provide additional results and details on the work presented in the main paper. In particular, we present histograms of IoU for selected methods in Section 1 and additional visualizations of shape reconstruction in Section 2.

1 Histograms of IoU for selected methods

In Figure 1 we provide a histogram of the IoU scores obtained across the shapes in the ShapeNet test set using three of the model evaluated in Table 2 of the main paper:

- Using $p(\mathbf{v}|\mathbf{z})p(\mathbf{z}|\mathbf{i})$, with Monte Carlo training (Table 2, row 1).
- Using $p(\mathbf{v}|\mathbf{z})p(\mathbf{z}|\mathbf{i})$, with variational training (Table 2, row 4).
- Using $p(\mathbf{v}|\mathbf{z})p(\mathbf{z}|\mathbf{i})$, with deterministic modeling (Table 2, row 7).

For each shape in the test set there are 24 views, giving a total of about 210k shape inferences.

The histograms show that the variational learning approach leads to more accurate reconstructions, leading to the largest number of reconstructed shapes in the last three bins for shape with $> 70\%$ IoU. For all other bins of less accurate results, the variational method has the smallest number of shapes.

Compared to the deterministic model, Monte Carlo training leads to more accurate reconstructions, but also to more very poor reconstructions.

2 Visualization of shape reconstruction results

In this section we provide visualization of additional shape reconstruction results, similar to the ones presented in the main paper. Contrary to the main paper we put randomly sampled examples here.

For each example in Figure 2, we show from left to right:

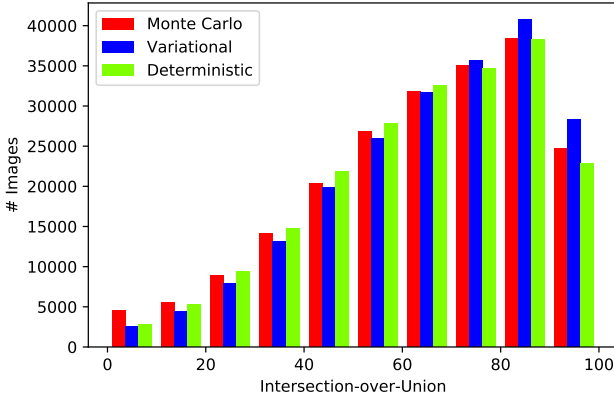


Figure 1: Histogram of IoU values on the ShapeNet test set for the Monte Carlo, variational, and deterministic model. See text for details. Bins of size 10 from 0 to 10, then 10 to 20, *etc.*

- the input image;
- ground-truth shape;
- inferred shape with Monte Carlo training;
- inferred shape with variational training;
- inferred shape with deterministic model.

These shape inference approaches correspond to rows one, four, and seven of Table 2 in the main paper.


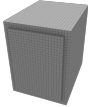
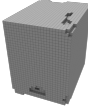
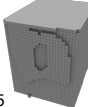
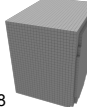

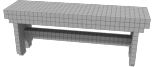
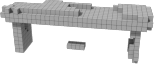
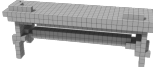
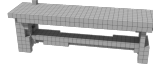

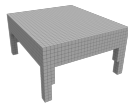
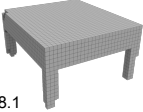
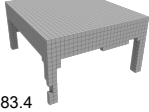
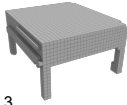











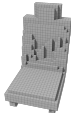


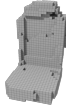
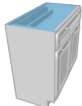
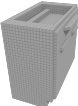
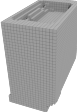



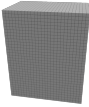
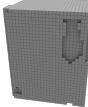
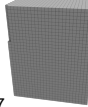
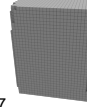
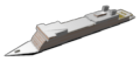
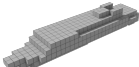
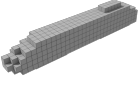
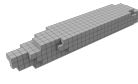
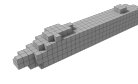

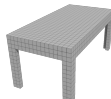
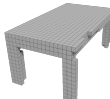
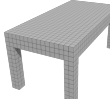
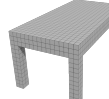
input image	ground truth	PRN MC	PRN var.	PRN var. det
		 95.9	 90.5	 91.8
		 56.4	 50.5	 45.2
		 98.1	 83.4	 73.3
		 72.3	 66.9	 68.0
		 56.0	 57.7	 49.5
		 55.1	 44.0	 51.4
		 88.1	 90.0	 81.9
		 52.2	 99.7	 93.7
		 59.0	 79.5	 65.3
		 85.9	 93.2	 96.0

Figure 2: Reconstruction results for random input images from the test set.