

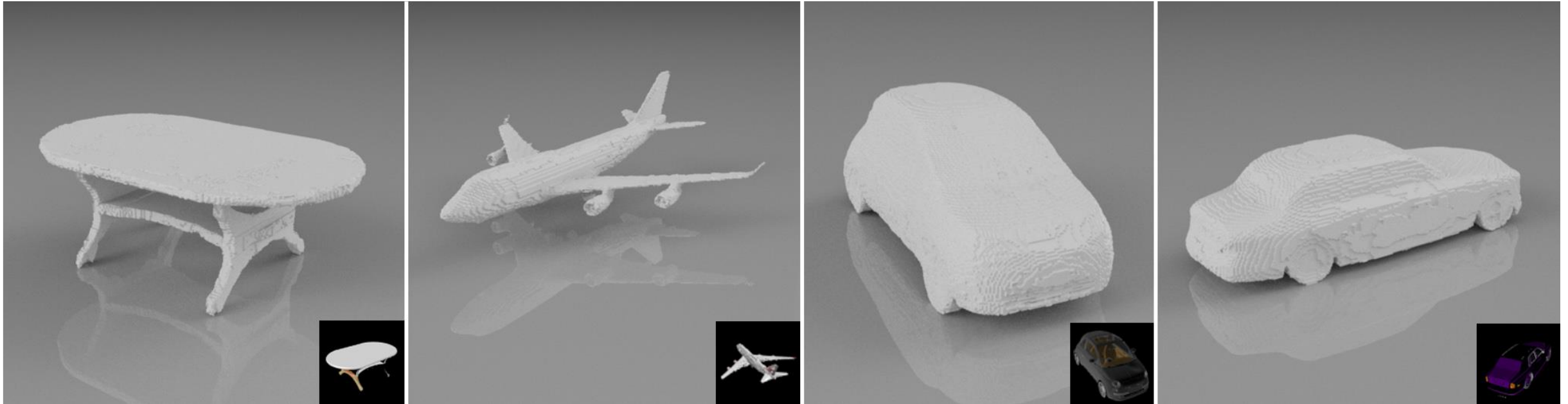


Matryoshka Networks: Predicting 3D Geometry via Nested Shape Layers

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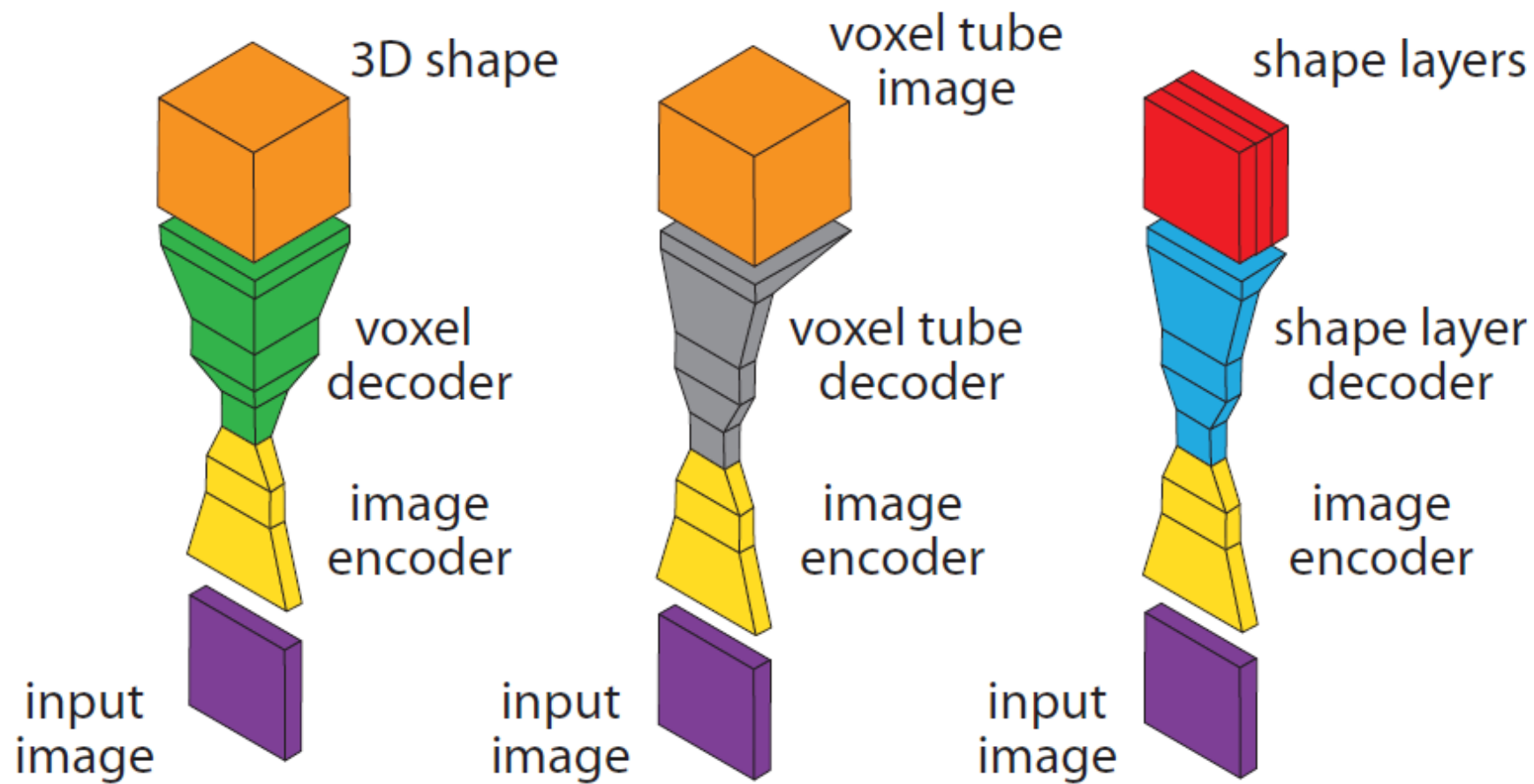
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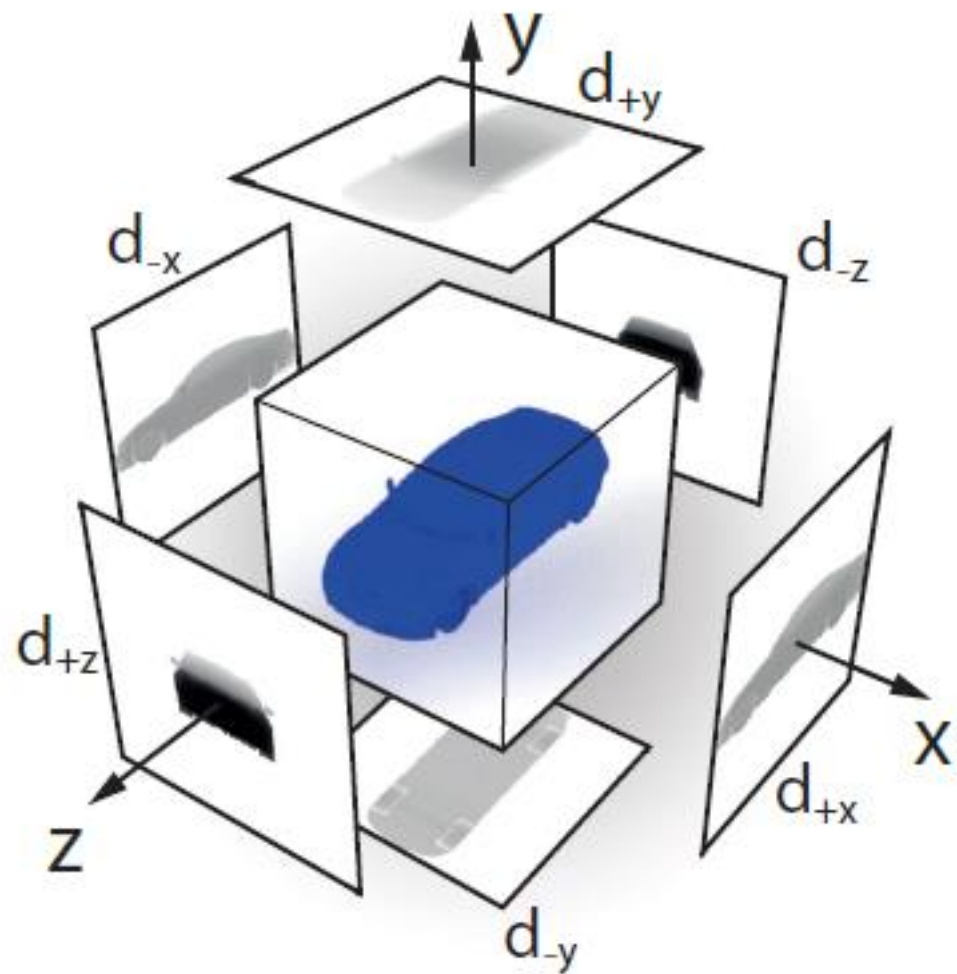
Goal: 3D reconstruction of object shapes from 2D images





- A new architecture for dense 3D shape reconstruction at low resolutions - **Voxel tube network**
- A proposal for high resolution 3D shape reconstruction through nested shape layers - **Matryoshka Network**
- Evaluation on **ShapeNet-core** dataset





$$S = \phi(\mathbf{d}) \equiv S_x \cap S_y \cap S_z \quad \text{with} \quad \phi : \mathcal{D} \rightarrow \mathcal{S}.$$



(a) $S_{1:5} =$

$((((S_1 \setminus S_2)$

$\cup S_3)$

$\setminus S_4)$

$\cup S_5.$

$$S_1 \equiv \phi(\mathbf{d}_1)$$

$$S_{1:2n} \equiv S_{1:2n-1} \setminus \phi(\mathbf{d}_{2n})$$

$$S_{1:2n+1} \equiv S_{1:2n} \cup \phi(\mathbf{d}_{2n+1})$$



(b) Matryoshka doll

Method	airplane	bench	cabinet	car	cellphone	chair	couch	firearm	lamp	monitor	speaker	table	watercraft	all
3D-R2N2 [5]	51.3	42.1	71.6	79.8	66.1	46.6	62.8	54.4	38.1	46.8	66.2	51.3	51.3	56.0
OGN [27]	58.7	48.1	72.9	81.6	70.2	48.3	64.6	59.3	39.8	50.2	63.7	53.6	63.2	59.6
PSGN [8]	60.1	55.0	77.1	83.1	74.9	54.4	70.8	60.4	46.2	55.2	73.7	60.6	61.1	64.0
Ours (voxel tube network)	67.1	63.7	76.7	82.1	74.2	55.0	69.0	62.6	43.6	53.4	68.1	57.3	59.9	64.1
Ours (Matryoshka network)	64.7	57.7	77.6	85.0	75.6	54.7	68.1	61.6	40.8	53.2	70.1	57.3	59.1	63.5

Method	Category	32 ³	64 ³	128 ³	256 ³
OGN [27]	car	64.1	77.1	78.2	76.6
Ours (Matryoshka)	car	68.3	78.4	79.4	79.6
	airplane	36.7	48.8	58.0	59.6
	table	38.6	42.3	43.5	41.3





Thank you for your attention

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