Multiview Aggregation for Learning Category-Specific Shape Reconstruction

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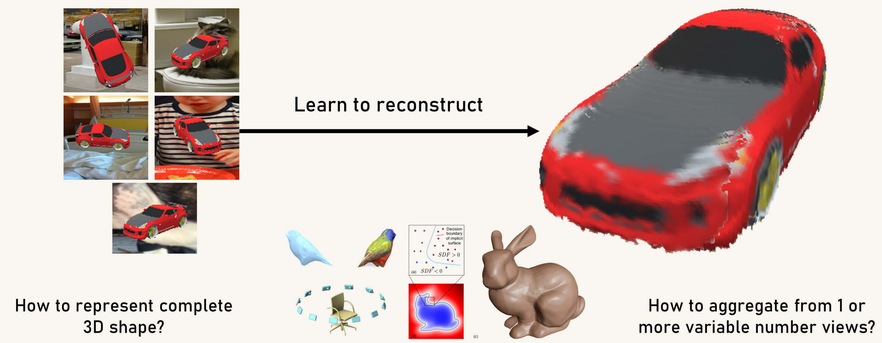
3D Object Shape Reconstruction

Reconstructing **3D object shape** from one or more views is an important problem.

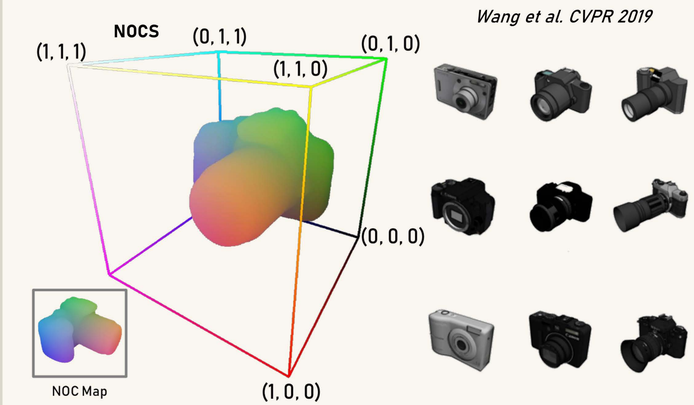
Applications

Goals & Challenges

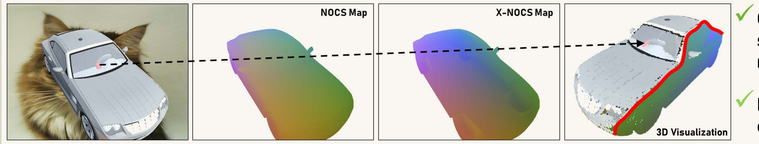
We want to **learn to predict** the 3D shape of objects belonging to specific categories from one or more images.



Normalized Object Coordinate Space (NOCS)

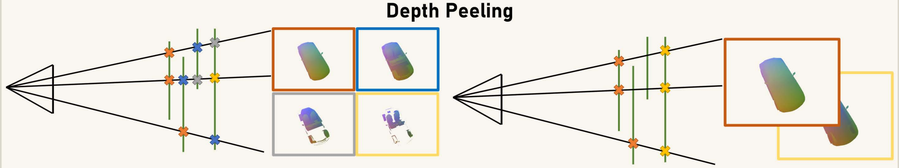


X-NOCS Maps



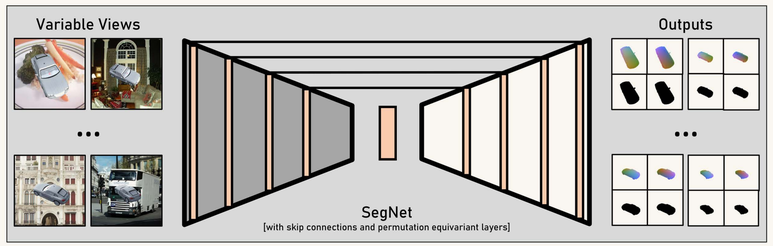
- ✓ Compact hidden surface representation
- ✓ Exact 2D-3D correspondence

Depth Peeling



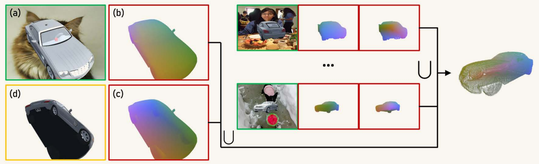
Flexible Multiview Aggregation

Network Architecture



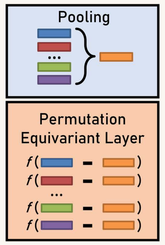
$$\mathcal{L}_v(\mathbf{y}, \hat{\mathbf{y}}) = w_m \, \mathcal{M}(M_v, \hat{M}_v) + w_l \frac{1}{m} \sum ||\mathbf{y} - \hat{\mathbf{y}}||_2$$

Correspondence-Free Aggregation

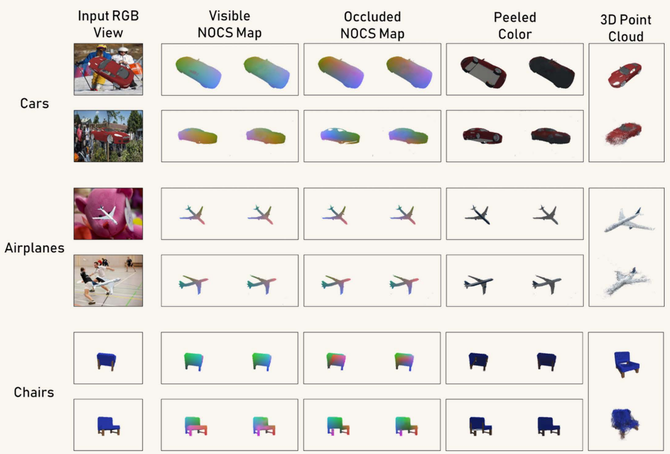


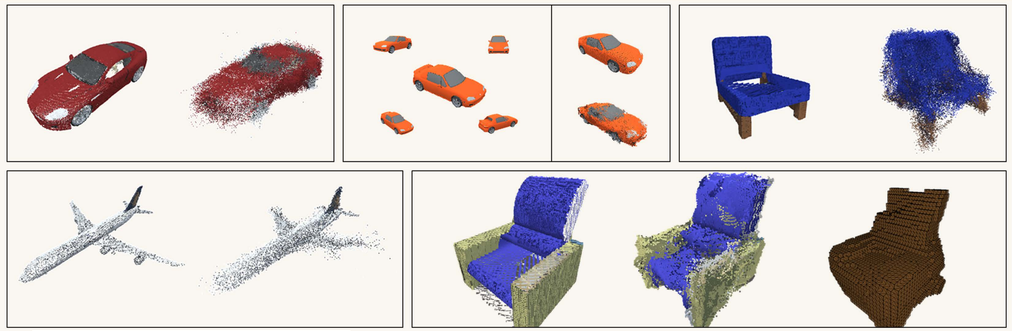
$$P_n = \bigcup_{i=0}^{n} \mathcal{R}(X_i)$$

Feature-Level Aggregation



Results & Comparisons





Category	Model	2 views	3 views	5 views
Cars	Single-View	0.4206	0.3974	0.3692
	Multiview	**0.3789**	**0.3537**	**0.2731**
Airplanes	Single-View	**0.1760**	**0.1677**	0.1619
	Multiview	0.2387	0.1782	**0.1277**
Chairs	Single-View	0.4249	0.3813	0.3600
	Multiview	**0.3649**	**0.2860**	**0.2457**

with 3D-R2N2 *(Choy et al., 2016)*

Method	2 views	3 views	5 views
3D-R2N2	0.2511	0.2191	0.1932
Ours	**0.2508**	**0.1952**	**0.1576**

with DPC *(Insafutdinov et al., 2018)*

Method	Cars	Airplanes	Chairs
DPC	0.2932	0.2549	0.4314
Ours	**0.1569**	**0.1855**	**0.3803**

Datasets & Code

Datasets and code available for download!

ShapeNetCOCO

ShapeNetPlain

Acknowledgements

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