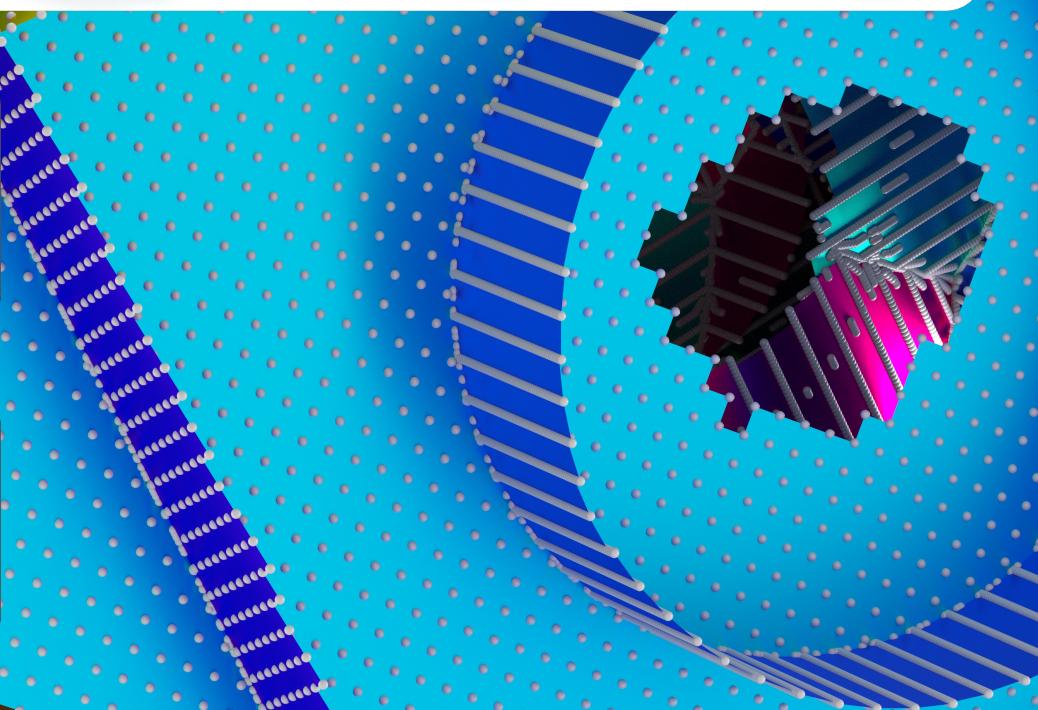
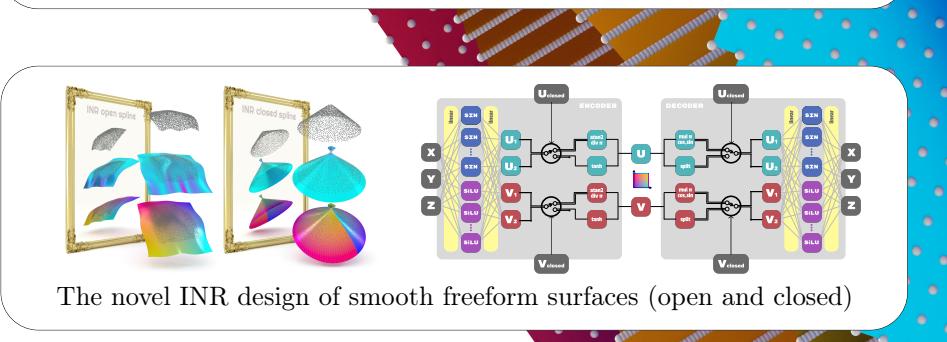


Point2CAD: Reverse Engineering CAD Models from 3D Point Clouds

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Point2CAD reconstructs complex CAD models from 3D point clouds. A point cloud is segmented into clusters corresponding to CAD faces. Each face is fitted with a geometric primitive or a parametric surface using a novel neural representation (INR). Due to the analytic representation, the surfaces can be extended and intersected to obtain topology, which is then used to clip the primitives and obtain *B*-rep format. Point2CAD sets a state of the art on the ABC benchmark of CAD models.



Columns: 1. input point cloud, 2. ground truth mesh, 3. reconstruction by ComplexGen, 4. HPNet segmentation + Point2CAD, 5. ParSeNet segmentation + Point2CAD, 6. GT segmentation + Point2CAD.

Method	Segmentation	Surfaces			$\theta_{\text{surface}} = 0.08$			$\theta_{\text{surface}} = 0.06$			$\theta_{\text{surface}} = 0.03$		
		precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑
ComplexGen	N/A	0.732	0.732	0.731	0.633	0.641	0.637	0.370	0.388	0.379			
Point2CAD	ParseNet	0.776	0.734	0.754	0.720	0.653	0.685	0.578	0.520	0.547			
Point2CAD	HPNet	0.815	0.733	0.772	0.770	0.664	0.713	0.644	0.540	0.587			
Point2CAD	GT	0.975	0.882	0.926	0.954	0.848	0.898	0.838	0.731	0.781			
Method	Segmentation	Edges			$\theta_{\text{edge}} = 0.06$			$\theta_{\text{edge}} = 0.03$			$\theta_{\text{edge}} = 0.02$		
		precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑
ComplexGen	N/A	0.687	0.641	0.663	0.421	0.396	0.408	0.290	0.279	0.284			
Point2CAD	ParseNet	0.689	0.644	0.666	0.426	0.460	0.443	0.332	0.381	0.355			
Point2CAD	HPNet	0.689	0.645	0.667	0.430	0.454	0.442	0.351	0.368	0.360			
Point2CAD	GT	0.759	0.780	0.769	0.570	0.612	0.590	0.493	0.517	0.505			
Method	Segmentation	Corners			$\theta_{\text{corner}} = 0.03$			$\theta_{\text{corner}} = 0.02$			$\theta_{\text{corner}} = 0.01$		
		precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑	precision ↑	recall ↑	F-score ↑
ComplexGen	N/A	0.667	0.633	0.650	0.483	0.454	0.468	0.217	0.203	0.210			
Point2CAD	ParseNet	0.669	0.634	0.651	0.494	0.547	0.519	0.349	0.401	0.373			
Point2CAD	HPNet	0.629	0.620	0.625	0.476	0.530	0.502	0.353	0.380	0.366			
Point2CAD	GT	0.739	0.707	0.723	0.653	0.631	0.642	0.451	0.524	0.485			

Quantitative evaluation of *Surfaces*, *Edges* and *Corners* reconstruction metrics on the ABC dataset with ComplexGen and flavors of Point2CAD.

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