Supplementary Material to PUGeo-Net: A Geometry-centric Network for 3D Point Cloud Upsampling

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1 Training and Testing Datasets

This section shows the selected 3D mesh models from Sketchfab [1], including 90 for training (Figs. 1 - 3) and 13 for quantitative evaluation (Fig. 4). We can see that the training and testing models have a wide range of shapes and rich geometric details. Their names are listed as follows.

1. **90 3D models for training**: Alliance-statue, Amphitrite, Ancient-turti, Angel5, Angel6, Angel-statue, Angel2, Angel3, Angel4, Angel-diffuse2, Armadillo, Arte, Brid-water, Buddha-sit, Camera, Chairman, Clito, Compressor, Dog-wing, Dragon1, Dragon-china, Dragon-cut, Dragon-plate, Dragon-stand, Dragon-warrior, Dragon-wing, Dragon2, Dwarf, Engine, Fox-skull, Ganesha, Ganesha-plane, Gargo, Grid-dog, God, Golden-elephant, Guanyiny, Gundam, Happy-vrip, Helmet, Hercules, Horses-fountain, Hunter, Karburator, Lady, Ladylady, Lion-ball, LL-exported, Man-face, Man-statue, Maria, Mesh-little-angle, Modello-buddha, Mozart, Nene-pato, Pearl-dragon, Roman-sphinx, Saiya, Sheep, Snake, Snow-head, Statue-air-force, Statue-bronze, Statue-child-fish, Statue-death, Statue-deer-lowboy, Statue-dragon, Statue-luyu, Statue-madona, Statue-mother, Statue-napoleon, Statue-neptune, Statue-neptune-horse, Statue-old, Statue-oxen, Statue-ramesses, Statue-rider, Statue-rome, Statue-three-music, Subtoll, Three-child, Transmission, Turkana-boy, Two-child, Two-wrestiers-in-combat, Valve, Vase-empire, Vase-lion, Vase-pot, Vishnu

2. **13 3D models for quantitative comparisons**: A9-vulcan, A72-seated-jew, Asklepios, Baron-seutin, Charite, Cheval, Cupid, Dame, Drunkard, Gramme, Madeleine, Retheur, Saint-lambert

2 More Visual Results

We show more visual results of our method and the state-of-the-art methods, PU-Net [4] and MPU [2], in Fig. 5 for scanned 3D models and Figs. 6 for man-

made 3D models. Notice those man-made 3D models are illustrated only for visualization comparisons and not involve in the quantitative comparisons. It can be observed that our method can successfully reconstruct models with geometric details and closest to the ground-truth ones. Meanwhile, our method can preserve sharp features well, as illustrated in Figs. 6.

Fig. 7 illustrates the reconstructed meshes from upsampled point cloud. It can be seen that as the upsample factor increases, PUGeo-Net can generate more uniformly distributed points, and the reconstructed surfaceis able to recover more details gradually to approach the groundtruth surface.

In Fig. 8, we show more examples for the 16× upsampling on ShapeNet [3], where the input points are non-uniformly distributed. The results in Fig. 8 can verify our proposed PUGeo-Net can successfully handle non-uniformly distributed data. In Fig. 9, we further test the robustness of our algorithm by adding Gaussian noise in various levels to such non-uniformly data. It can be observed that our method results in good performance even adding 2% Gaussian noise.

3 Detailed Quantitative Results

In Tables 1 - 5, we show the quantitative results of each of the 13 scanned 3D models. It can be observed that our PUGeo-Net can achieve the best performance almost for all the testing models, regardless of the upsample factor or specific metric.

4 Visual Results of Large Upsampling Factors

The existing methods, PU-Net and MPU, increase the resolution with a factor typically in the range $R \in [4, 16]$. Our method can work for even larger factors without significant increasing the model size or training time. Fig. 10 shows our results with $R = 12$ and $R = 36$. It can be observed that when $R = 36$, the reconstructed models contain more geometrical detail with sharper local structures.

Fig. 1: 90 3D models for training (Part 1/3).

Fig. 2: 90 3D models for training (Part 2/3).

Fig. 3: 90 3D models for training (Part 3/3).

Model: A72-seated-jew									
R	Method	CD	HD	JSD	P2F mean	P2F std	surface CD	HD	JSD
4×	EAR	1.002	11.436	4.689	4.857	12.357	0.935	11.165	7.901
	PU-Net	0.633	0.955	0.869	1.546	1.201	**0.523**	**5.373**	**4.341**
	MPU	0.548	1.227	0.530	0.815	0.791	0.549	5.649	4.531
	PUGeo-Net	**0.496**	**0.860**	**0.397**	**0.639**	**0.690**	0.524	6.563	4.385
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.531	1.582	0.853	1.828	1.433	0.508	6.358	4.498
	MPU	0.426	1.497	0.481	0.939	0.939	0.484	6.106	4.306
	PUGeo-Net	**0.375**	**0.896**	**0.371**	**0.676**	**0.728**	**0.433**	**5.462**	**3.959**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.416	0.863	0.505	1.287	1.092	0.429	5.381	3.865
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.321**	**0.961**	**0.314**	**0.695**	**0.717**	**0.420**	**5.363**	**3.809**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.465	1.526	1.059	2.052	1.612	0.505	6.406	4.477
	MPU	0.331	1.146	0.450	0.910	0.943	0.466	5.917	4.147
	PUGeo-Net	**0.287**	**0.972**	**0.390**	**0.723**	**0.785**	**0.424**	**5.403**	**3.903**
Model:	A9-vulcan								
4×	EAR	1.224	5.907	7.598	6.258	7.784	1.575	13.645	13.856
	PU-Net	0.592	**1.005**	0.865	1.387	1.113	**1.025**	14.293	9.580
	MPU	**0.510**	1.029	0.515	0.691	0.738	1.032	**14.175**	**9.316**
	PUGeo-Net	0.636	1.011	**0.427**	**0.537**	**0.681**	1.220	15.559	9.787
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.492	1.383	1.023	1.651	1.316	1.146	15.260	9.694
	MPU	**0.399**	1.129	0.624	0.855	0.925	1.143	15.278	9.511
	PUGeo-Net	0.471	**1.041**	**0.437**	**0.563**	**0.729**	**1.097**	**15.071**	**9.446**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.383	**0.897**	0.601	1.133	0.999	**0.984**	**14.347**	**9.102**
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.402**	1.023	**0.406**	**0.576**	**0.707**	1.115	15.282	9.359
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.431	1.522	1.286	1.890	1.543	**1.081**	**14.847**	9.350
	MPU	**0.303**	**1.158**	0.590	0.803	0.950	1.117	15.298	9.349
	PUGeo-Net	0.356	1.229	**0.491**	**0.614**	**0.782**	1.094	15.357	**9.143**
Model:	Asklepios								
4×	EAR	1.188	11.677	8.676	7.098	13.860	3.265	15.911	27.037
	PU-Net	0.570	0.884	0.708	1.444	1.139	2.198	**15.250**	**16.879**
	MPU	**0.489**	1.063	0.381	0.766	0.788	**2.224**	15.405	16.975
	PUGeo-Net	0.533	**1.013**	**0.351**	**0.621**	**0.708**	2.274	15.697	17.279
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.487	1.156	0.829	1.751	1.371	**2.069**	14.458	**16.485**
	MPU	**0.387**	1.167	0.492	0.920	0.957	2.194	15.286	16.914
	PUGeo-Net	0.403	**1.106**	**0.350**	**0.650**	**0.762**	2.083	**14.130**	16.609
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.383	**0.897**	0.601	1.181	0.997	2.130	15.229	16.535
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.347**	1.036	**0.338**	**0.661**	**0.732**	**2.058**	**14.561**	**16.380**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.438	1.417	1.007	2.043	1.602	2.046	14.641	**16.202**
	MPU	**0.301**	1.543	0.548	0.894	1.028	2.154	15.344	16.633
	PUGeo-Net	0.313	**1.072**	**0.407**	**0.706**	**0.802**	**2.029**	**14.331**	16.209

Table 1: Quantitative comparisons for 3D scanned models. (1/5)

Model:	Baron-seutin								
R	Method	CD	HD	JSD	P2F mean	P2F std	surface CD	HD	JSD
4×	EAR	0.757	2.509	1.757	7.098	13.860	0.780	8.177	4.830
	PU-Net	0.649	1.085	0.890	1.483	1.169	0.605	8.675	4.365
	MPU	0.561	1.112	0.453	0.723	0.734	0.607	8.657	4.277
	PUGeo-Net	**0.476**	**0.890**	**0.390**	**0.545**	**0.620**	**0.601**	**8.145**	**4.243**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.540	1.477	0.878	1.788	1.405	0.560	9.126	4.152
	MPU	0.431	1.157	0.375	0.826	0.848	0.539	8.964	4.029
	PUGeo-Net	**0.360**	**1.013**	**0.296**	**0.569**	**0.689**	**0.518**	**8.793**	**3.898**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.414	**0.941**	0.502	1.168	1.036	**0.503**	**8.720**	**3.808**
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.313**	0.988	**0.270**	**0.592**	**0.670**	0.508	8.846	3.815
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.477	1.577	1.005	2.072	1.625	0.577	9.505	4.223
	MPU	0.327	1.121	0.316	0.785	0.860	0.532	**8.981**	3.946
	PUGeo-Net	**0.283**	**1.093**	**0.284**	**0.606**	**0.722**	**0.521**	9.226	**3.939**
Model:	Charite								
4×	EAR	0.967	4.739	3.561	7.098	13.860	0.856	4.127	4.801
	PU-Net	0.746	1.052	0.979	1.781	1.384	0.521	1.894	1.891
	MPU	0.663	1.317	0.608	1.137	1.107	0.511	1.072	1.634
	PUGeo-Net	**0.549**	**1.052**	**0.458**	**0.908**	**0.968**	**0.486**	**1.003**	**1.622**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.630	1.269	0.884	2.131	1.643	0.478	3.754	2.214
	MPU	0.531	1.541	0.571	1.352	1.311	0.498	4.106	2.520
	PUGeo-Net	**0.409**	**0.982**	**0.348**	**0.946**	**1.004**	**0.332**	**0.991**	**0.614**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.522	1.138	0.786	1.706	1.413	0.525	3.726	3.040
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.349**	**0.940**	**0.330**	**0.953**	**1.001**	**0.322**	**0.831**	**0.541**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.552	1.377	0.982	2.426	1.877	0.369	1.769	0.695
	MPU	0.425	1.704	0.721	1.381	1.443	0.377	2.265	1.094
	PUGeo-Net	**0.312**	**0.947**	**0.353**	**1.006**	**1.076**	**0.307**	**0.694**	**0.451**
Model:	Cheval-terracotta								
4×	EAR	0.859	3.713	2.527	2.545	3.640	0.646	3.095	3.160
	PU-Net	0.737	1.149	0.831	1.673	1.303	0.358	1.482	1.053
	MPU	**0.641**	1.002	0.576	0.860	0.883	0.398	3.072	1.398
	PUGeo-Net	0.643	**0.907**	**0.543**	0.648	**0.771**	**0.346**	**1.147**	**0.936**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.607	1.766	0.847	2.131	1.643	0.336	0.831	0.965
	MPU	0.501	1.246	0.477	1.036	1.064	0.329	0.718	0.840
	PUGeo-Net	**0.491**	**1.227**	**0.383**	**0.670**	**0.812**	**0.303**	**0.692**	**0.695**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.482	1.064	0.651	1.384	1.262	0.299	1.485	0.512
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.430**	**1.058**	**0.340**	**0.692**	**0.797**	**0.272**	**0.665**	**0.463**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.535	1.693	0.854	2.270	1.798	0.340	3.764	0.803
	MPU	0.384	1.545	0.423	1.381	1.443	0.280	1.046	0.372
	PUGeo-Net	**0.391**	**0.983**	**0.346**	**0.731**	**0.864**	**0.253**	**0.666**	**0.333**

Table 2: Quantitative comparisons for 3D scanned models. (2/5)

Model:	Cupid								
R	Method	CD	HD	JSD	P2F mean	P2F std	surface CD	HD	JSD
4×	EAR	0.965	4.502	4.058	3.825	4.866	0.857	5.921	5.765
	PU-Net	0.698	**0.948**	0.928	1.613	1.274	0.512	6.493	3.079
	MPU	**0.608**	0.999	0.567	0.817	0.793	0.541	6.480	3.156
	PUGeo-Net	0.626	1.011	**0.525**	**0.637**	**0.719**	**0.512**	**6.170**	**2.942**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.585	1.415	0.886	1.942	1.519	0.444	7.017	2.673
	MPU	0.474	1.068	0.505	0.995	0.982	0.429	6.780	2.528
	PUGeo-Net	**0.470**	**1.026**	**0.388**	**0.657**	**0.751**	**0.407**	**6.597**	**2.454**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.466	**1.007**	0.654	1.412	1.202	0.410	6.625	2.481
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.405**	1.085	**0.348**	**0.684**	**0.744**	**0.399**	**6.449**	**2.384**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.518	1.388	1.006	2.259	1.750	0.430	6.926	2.516
	MPU	0.360	1.428	0.452	0.928	1.011	0.421	6.843	2.486
	PUGeo-Net	**0.360**	**1.012**	**0.347**	**0.719**	**0.813**	**0.406**	**6.680**	**2.496**
Model:	Dame								
Dr 4×	EAR	0.993	6.450	5.579	4.317	7.044	0.962	6.319	8.189
	PU-Net	0.655	1.061	1.121	1.470	1.215	0.422	1.390	2.266
	MPU	**0.579**	**0.989**	0.793	0.850	0.812	0.451	1.199	2.655
	PUGeo-Net	0.592	0.990	**0.460**	**0.635**	**0.729**	**0.366**	**0.853**	**1.292**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.552	1.177	1.460	1.813	1.412	0.312	1.181	1.099
	MPU	0.454	1.063	0.551	0.988	0.968	0.308	1.780	0.751
	PUGeo-Net	**0.445**	**1.022**	**0.372**	**0.678**	**0.757**	**0.257**	**0.621**	**0.486**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.440	0.924	0.849	1.314	1.172	0.280	1.358	0.854
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.381**	**0.894**	**0.322**	**0.687**	**0.759**	**0.245**	**0.630**	**0.275**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.487	1.380	1.599	2.122	1.680	0.297	1.499	0.668
	MPU	0.349	1.169	0.507	0.937	1.017	0.267	1.166	0.502
	PUGeo-Net	**0.341**	**0.947**	**0.361**	**0.735**	**0.840**	**0.239**	**0.641**	**0.217**
Model:	Drunkard								
4×	EAR	0.887	3.780	3.184	2.708	3.751	0.651	4.097	3.854
	PU-Net	0.734	1.068	1.667	1.470	1.215	0.389	1.821	1.374
	MPU	0.644	1.183	1.270	0.892	0.890	0.402	1.004	2.434
	PUGeo-Net	**0.562**	**0.943**	**0.622**	**0.663**	**0.829**	**0.369**	**0.997**	**1.147**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.613	1.499	2.258	2.007	1.576	0.311	1.903	0.935
	MPU	0.501	1.410	0.886	1.034	1.079	0.297	**0.765**	0.737
	PUGeo-Net	**0.423**	**1.037**	**0.494**	**0.720**	**0.853**	**0.273**	0.825	**0.544**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.485	1.107	1.139	1.414	1.300	0.289	2.307	0.659
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.367**	**0.987**	**0.412**	**0.720**	**0.859**	**0.264**	**0.883**	**0.345**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.535	1.602	2.260	2.289	1.865	0.309	2.186	0.744
	MPU	0.384	1.277	0.822	0.989	1.135	0.282	1.094	0.757
	PUGeo-Net	**0.329**	**1.131**	**0.448**	**0.747**	**0.939**	0.258	**0.803**	**0.328**

Table 3: Quantitative comparisons for 3D scanned models. (3/5)

Model:	Gramme								
R	Method	CD	HD	JSD	P2F mean	P2F std	surface CD	HD	JSD
4×	EAR	0.841	3.371	3.641	2.279	2.872	0.566	1.597	5.021
	PU-Net	0.754	1.038	1.559	1.686	1.366	0.342	1.081	1.101
	MPU	0.653	0.951	1.234	0.831	0.802	0.356	1.026	1.997
	PUGeo-Net	**0.628**	**0.921**	**0.566**	**0.583**	**0.700**	**0.317**	**0.954**	**0.536**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.621	1.277	2.360	1.987	1.536	0.319	0.913	0.825
	MPU	0.504	1.089	0.781	0.968	0.986	0.310	0.835	0.618
	PUGeo-Net	**0.472**	**0.866**	**0.406**	**0.609**	**0.710**	**0.291**	**0.752**	**0.394**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.490	1.039	1.058	1.394	1.278	0.275	0.854	0.332
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.408**	**0.953**	**0.370**	**0.607**	**0.712**	**0.247**	**0.717**	**0.166**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.538	1.516	2.071	2.255	1.834	0.288	0.983	0.506
	MPU	0.381	1.308	0.472	0.921	1.051	0.274	0.827	0.245
	PUGeo-Net	**0.365**	**0.907**	**0.431**	**0.632**	**0.773**	**0.240**	**0.758**	**0.150**
Model:	Madeleine								
4×	EAR	0.732	3.392	2.064	2.579	2.683	0.762	**6.016**	4.478
	PU-Net	0.580	**0.845**	0.639	1.396	1.063	0.424	6.215	2.223
	MPU	0.495	0.864	**0.338**	**0.649**	0.642	0.437	6.358	2.293
	PUGeo-Net	**0.481**	0.921	0.566	0.460	**0.508**	**0.403**	6.538	**2.043**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.485	0.980	0.615	1.633	1.239	0.437	6.934	2.325
	MPU	0.383	1.195	0.275	0.765	0.764	0.414	6.497	2.197
	PUGeo-Net	**0.358**	**0.851**	**0.233**	**0.482**	**0.547**	**0.400**	**6.985**	**2.138**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.378	0.830	0.408	1.143	0.985	0.389	**6.630**	2.089
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.314**	**0.795**	**0.292**	**0.607**	**0.712**	**0.375**	6.863	**2.002**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.419	1.354	0.675	1.815	1.427	0.410	7.043	2.165
	MPU	0.289	1.092	0.257	0.718	0.755	0.378	**6.563**	1.988
	PUGeo-Net	**0.272**	**0.928**	**0.220**	**0.522**	**0.597**	**0.354**	6.728	**1.926**

Table 4: Quantitative comparisons for 3D scanned models. (4/5)

Model:	Retheur								
R	Method	CD	HD	JSD	P2F mean	P2F std	surface CD	HD	JSD
4×	EAR	0.732	3.392	2.064	3.066	3.648	0.659	1.275	2.678
	PU-Net	0.658	0.957	0.750	1.437	1.142	0.585	5.526	3.660
	MPU	0.583	1.108	0.462	0.791	0.812	0.390	0.906	1.260
	PUGeo-Net	**0.569**	**0.891**	**0.443**	**0.613**	**0.741**	**0.384**	**0.884**	**1.227**
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.539	1.024	0.657	1.665	1.304	0.292	0.844	0.654
	MPU	0.454	1.090	0.352	0.940	0.953	0.288	0.840	0.609
	PUGeo-Net	**0.427**	**0.952**	**0.276**	**0.627**	**0.771**	**0.267**	**0.703**	**0.528**
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.378	**0.830**	0.408	1.255	1.108	0.485	5.638	3.077
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.367**	0.870	**0.224**	**0.643**	**0.756**	**0.259**	**0.661**	**0.476**
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.470	1.274	0.646	1.935	1.534	0.508	6.287	3.094
	MPU	0.352	1.664	0.318	0.940	1.074	0.452	5.331	2.634
	PUGeo-Net	**0.327**	**0.847**	**0.245**	**0.665**	**0.806**	**0.247**	**0.728**	**0.348**
Model: Saint-lambert									
4×	EAR	0.675	3.979	2.151	2.396	3.166	0.771	6.445	5.208
	PU-Net	0.550	0.984	0.541	1.354	1.060	0.521	6.555	3.618
	MPU	0.470	1.105	**0.250**	0.682	0.720	0.508	**6.403**	**3.437**
	PUGeo-Net	**0.463**	**0.859**	0.289	**0.535**	**0.619**	**0.505**	6.612	3.624
8×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.457	1.080	0.585	1.555	1.238	0.514	6.428	3.490
	MPU	0.370	1.241	0.269	0.811	0.862	0.479	6.440	**3.247**
	PUGeo-Net	**0.349**	**0.954**	**0.254**	**0.564**	**0.659**	**0.476**	**6.390**	3.275
12×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.378	**0.830**	0.408	1.084	0.957	0.447	**6.429**	**3.184**
	MPU	-	-	-	-	-	-	-	-
	PUGeo-Net	**0.299**	1.119	**0.258**	**0.577**	**0.651**	**0.444**	6.569	3.178
16×	EAR	-	-	-	-	-	-	-	-
	PU-Net	0.401	1.316	0.699	1.765	1.419	0.483	6.437	3.233
	MPU	0.352	1.664	0.318	0.833	0.973	0.452	**6.393**	**3.041**
	PUGeo-Net	**0.270**	**1.076**	**0.314**	**0.618**	**0.713**	**0.440**	6.451	3.188

Table 5: Quantitative comparisons for 3D scanned models. (5/5)

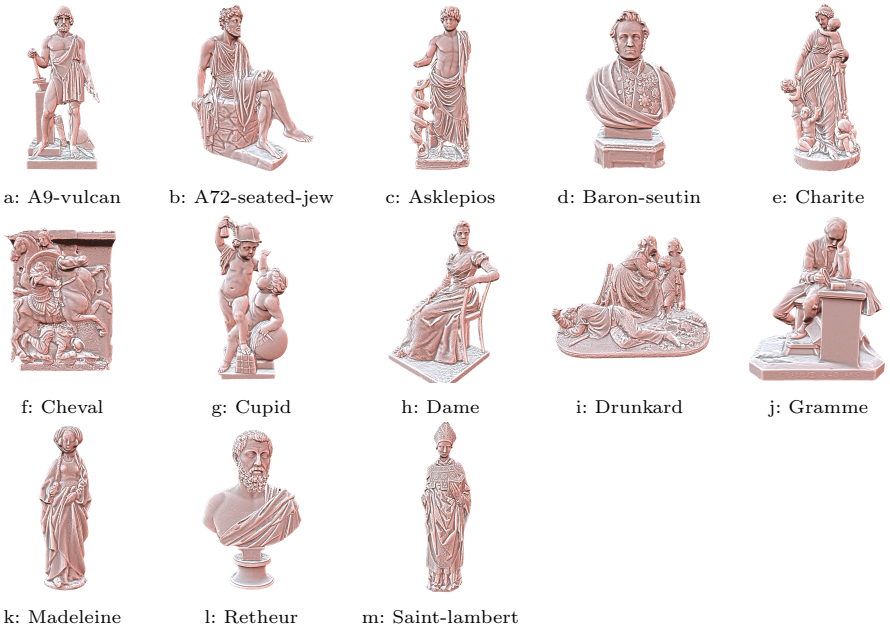

Fig. 4: 13 3D models for quantitative evaluation.

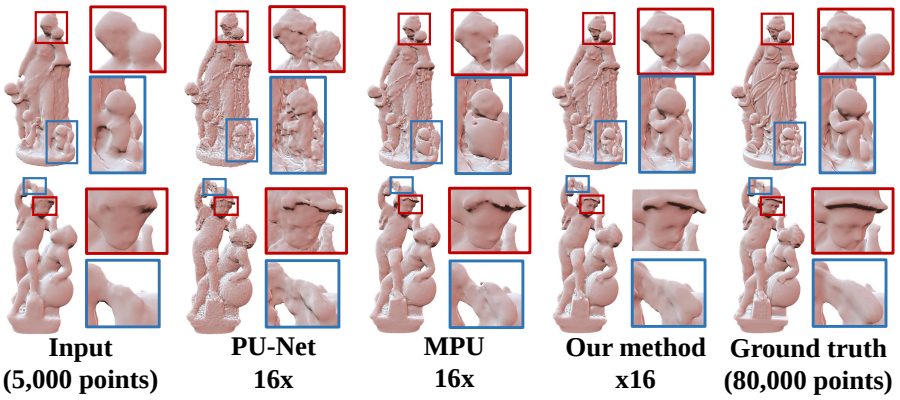

Fig. 5: More visual comparisons over scanned 3D models.

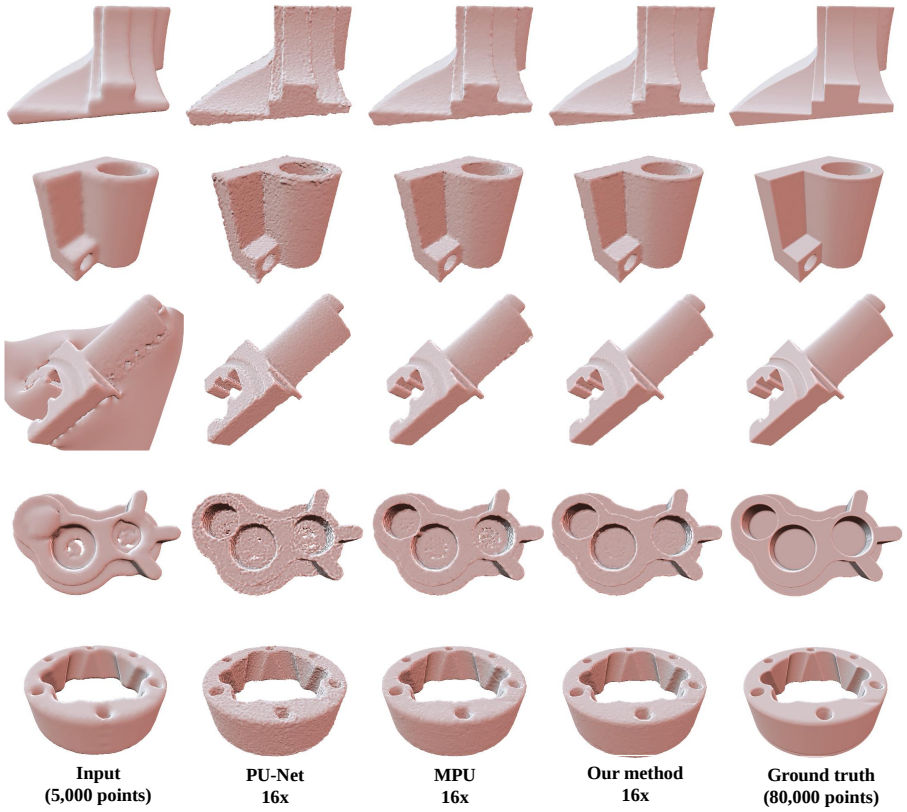

Fig. 6: More visual comparisons over man-made 3D models.

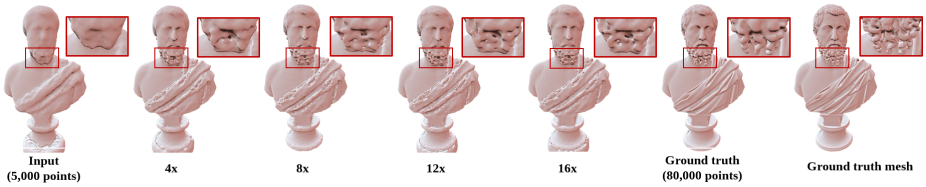

Fig. 7: Illustration of various sampling factors of the Retheur Statue model with 5,000 points. Due to the low-resolution input, the details, such as cloth wrinkles and facial features, are missing. PUGeo-Net can effectively generate up to 16× points to fill in the missing part. See also the accompanying video and results.

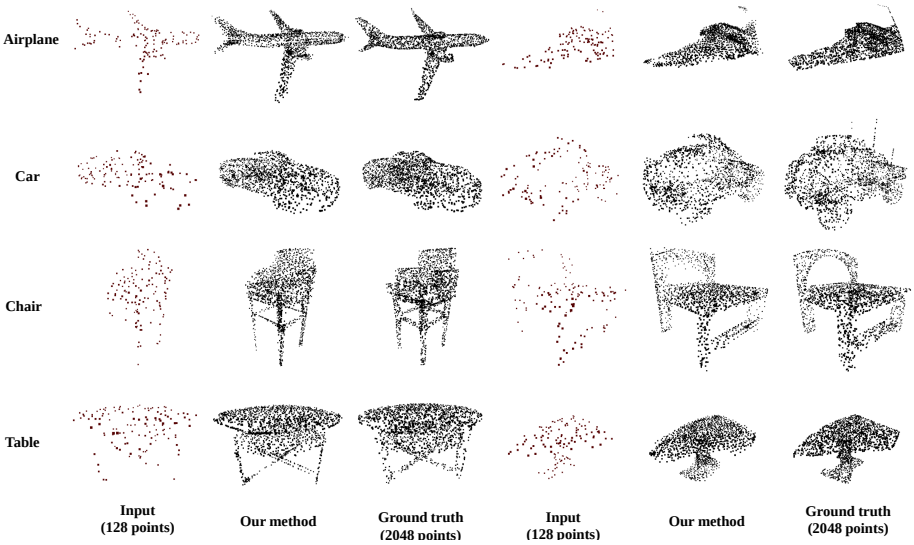

Fig. 8: More visual comparisons for non-uniform inputs.

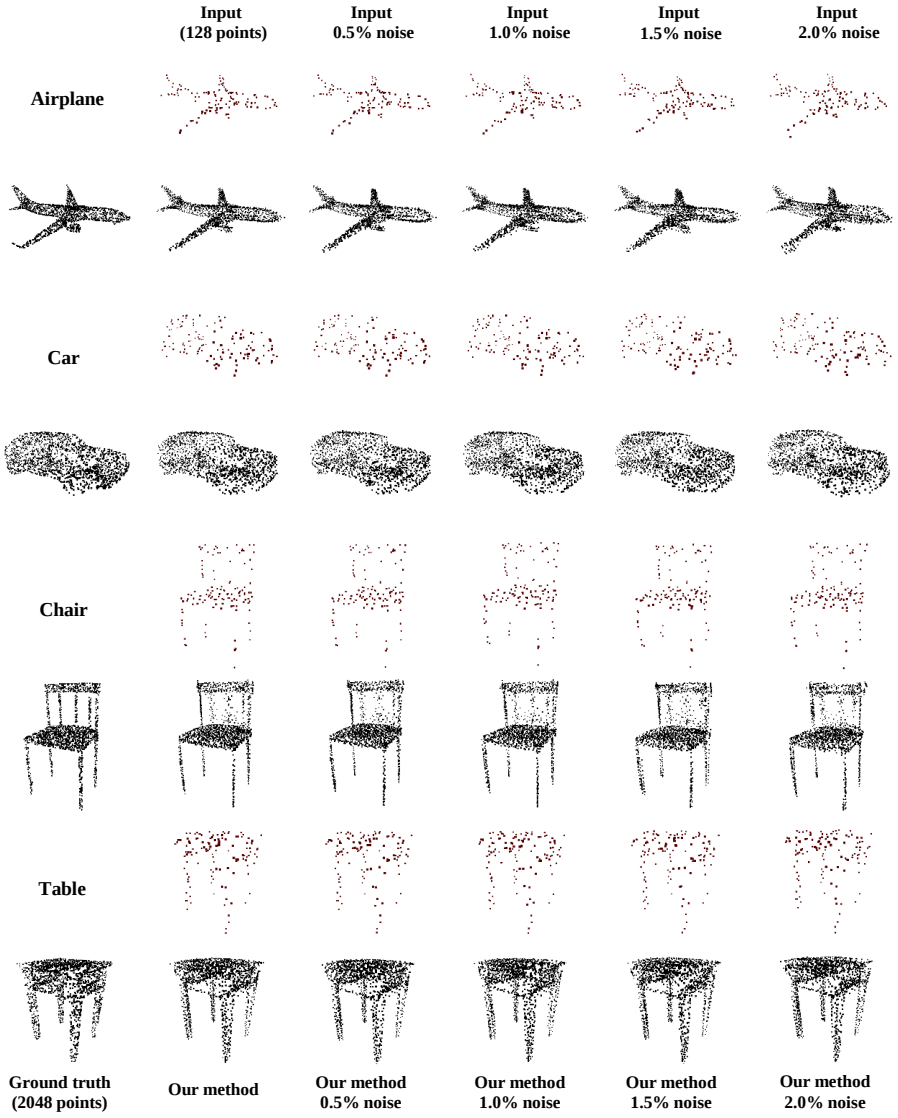

Fig. 9: More visual comparisons over noisy data.

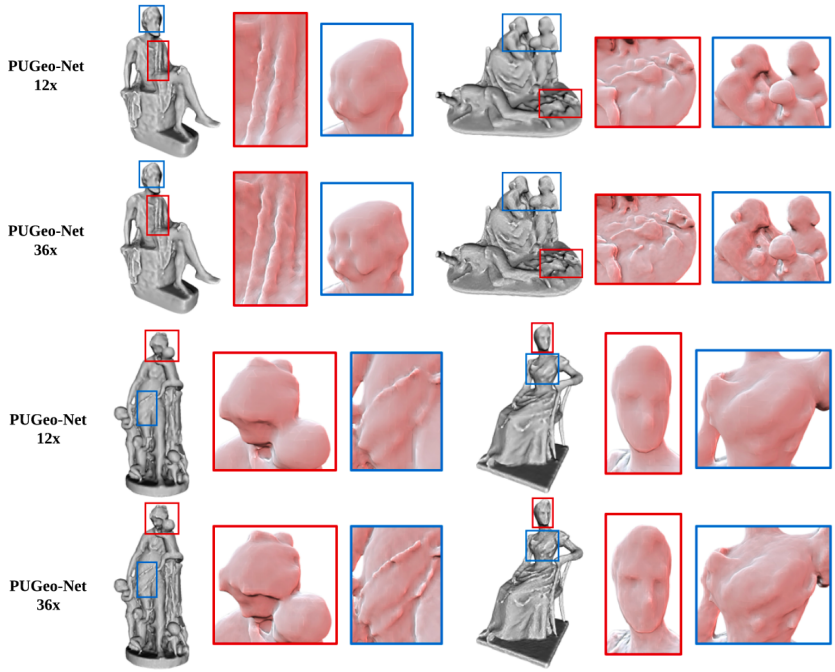

Fig. 10: Results of our method with the upsampling factor $R = 36$. The results of our method with $R = 12$ are also provided as references.

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