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Building "BASICS": Broad Quality Assessment of Static Point Clouds in a Compression Scenario

Emin Zerman

Based on

Ak, A., Zerman, E., Quach, M., Chetouani, A., Smolic, A., Valenzise, G., & Le Callet, P. (2024).
BASICS: Broad quality assessment of static point clouds in a compression scenario.
IEEE Transactions on Multimedia.

Starting point

Identifying needs:

- A large dataset for learning-based *-- VSENSE_VVDB2, JPEG Pleno*
- A large dataset for benchmarking

Dataset	nb SRC	nb PPC	nb obs per PPC	total nb obs	Display	Visualization	Subj. test method	Temporal dimension	Distortions
BASICS (proposed)	75	1494	60	3600	2D	Passive	DSIS (side-by-side)	Static	Compression: GPCC, VPCC, GEOCNN
vsenseVVDB2 [6]	8	136	23	23	2D	Passive	ACR	Dynamic	Compression: GPCC, VPCC
Perry et al. [7]	6	90	-	73	2D	Passive	DSIS (side-by-side)	Static	Compression: GPCC, VPCC
da Silva Cruz et al. [8]	8	48	-	50	2D	Passive	DSIS	Static	Octree pruning Projection-based compression from 3DTK
Yang et al. [9]	10	420	16	64	2D	Passive	ACR	Static	Octree pruning, random point down-sample Color noise, geometric gaussian noise
Su et al. [10]	20	740	-	60	2D	Passive	DSIS (side-by-side)	Static	Octree pruning, geometric gaussian noise Compression: SPCC, VPCC, LPCC
NBU-PCD1.0 [11]	10	160	-	-	2D	-	-	Static	Octree pruning
SIAT-PCQD [12]	20	340	38	76	HMD	Interactive	DSIS	Static	Compression: VPCC
Subramanyam et al. [13]	8	64	-	52	HMD	Interactive	ACR-HR	Dynamic	Compression: VPCC
PointXR [14]	5	40	20	40	HMD	Interactive	DSIS	Static	Compression: GPCC

Starting building the database – Collecting interesting models

Requirements

- Interesting content for telepresence & telecommunication applications
- Available to us – *or publicly available*
- Can be made publicly available afterwards – *redistribution*

Collecting 3D models

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VSENSE

XD Productions

???

Collecting 3D models

XD Productions

VSENSE

???

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Collecting 3D models

VSENSE | XD Productions | ???

Sketchfab

3D models with CC-BY or CC-0 licences

Sketchfab EXPLORE BUY 3D MODELS FOR BUSINESS UPLOAD

Chateau de la Bretesche -RAWscan

3D Model

Andrea Spognetta (Spogna)

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Triangles: **1.3M** Vertices: **632k** More model information

Chateau de la Bretesche

Photogrammetry from video

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Chateau de la Bretesche -RAWscan

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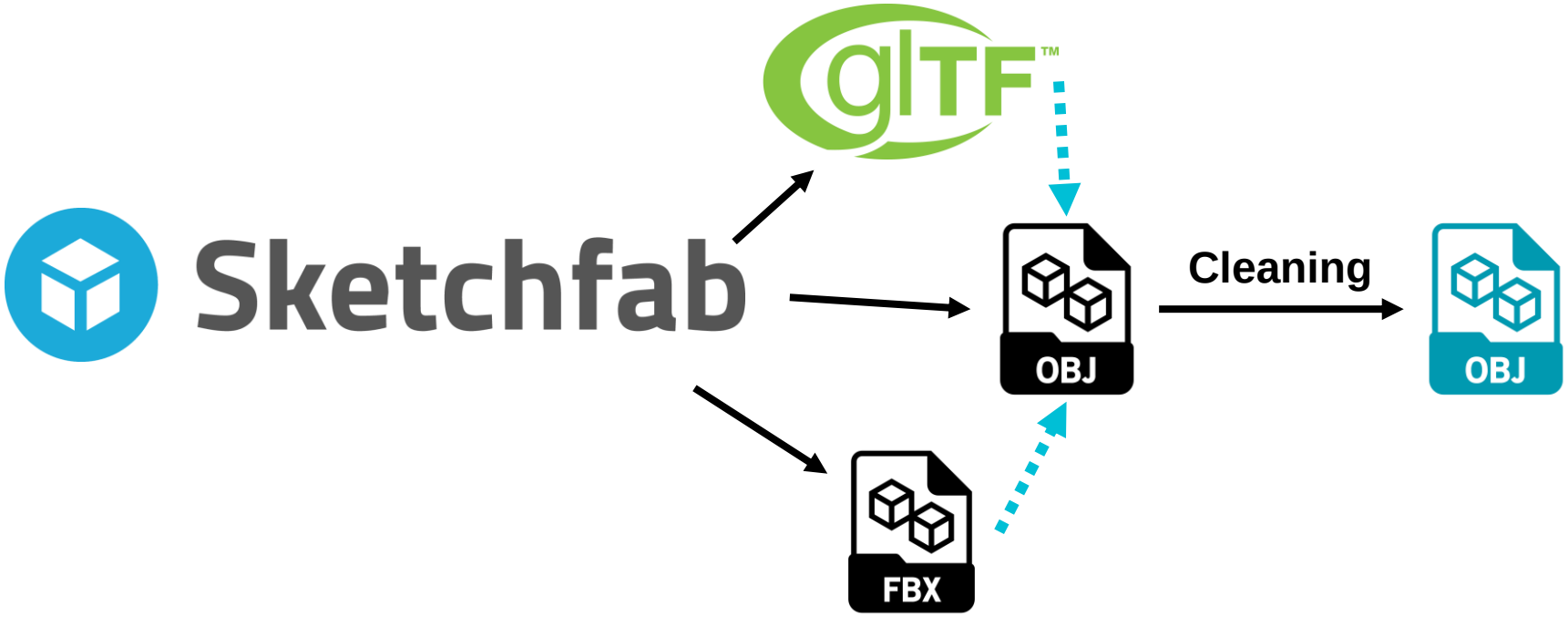
Collecting 3D models

VSENSE | **XD Productions** | **Publicly available 3D models w/ CC-BY or CC-0 licence**



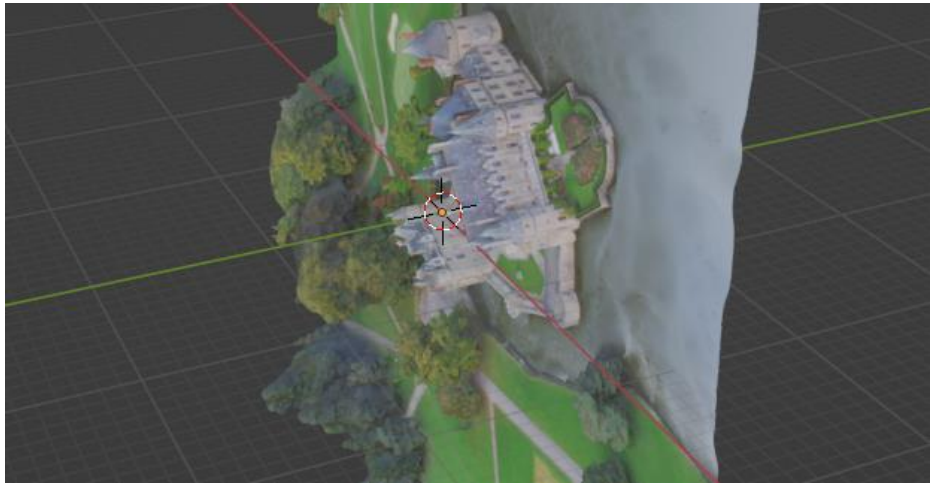
Collecting 3D models

VSENSE

XD Productions

Publicly available 3D models w/ CC-BY or CC-0 licence

Sketchfab → OBJ → Cleaning → OBJ



Collecting 3D models

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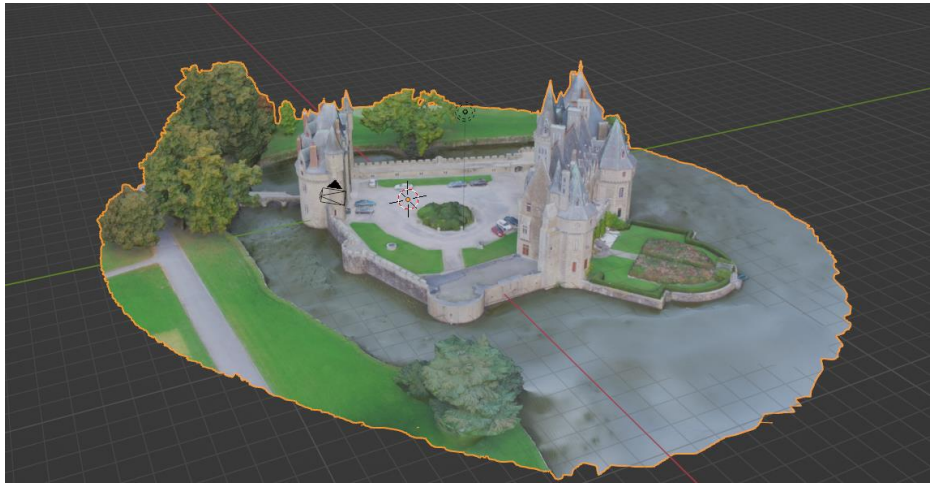
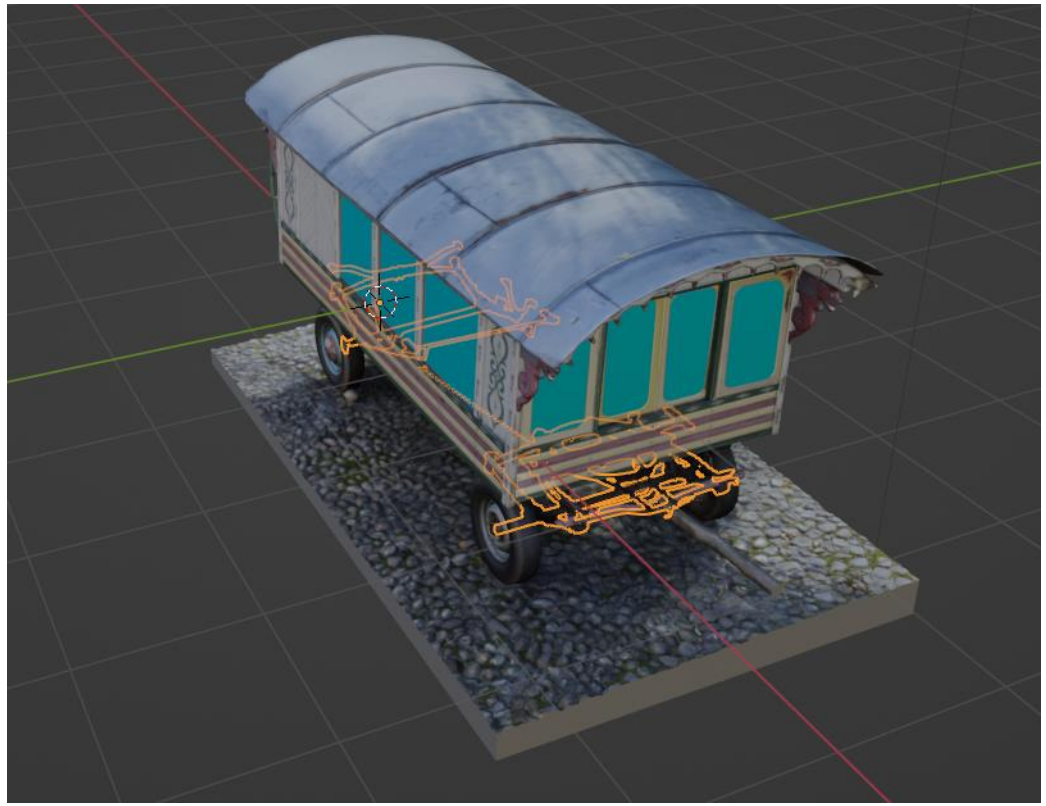
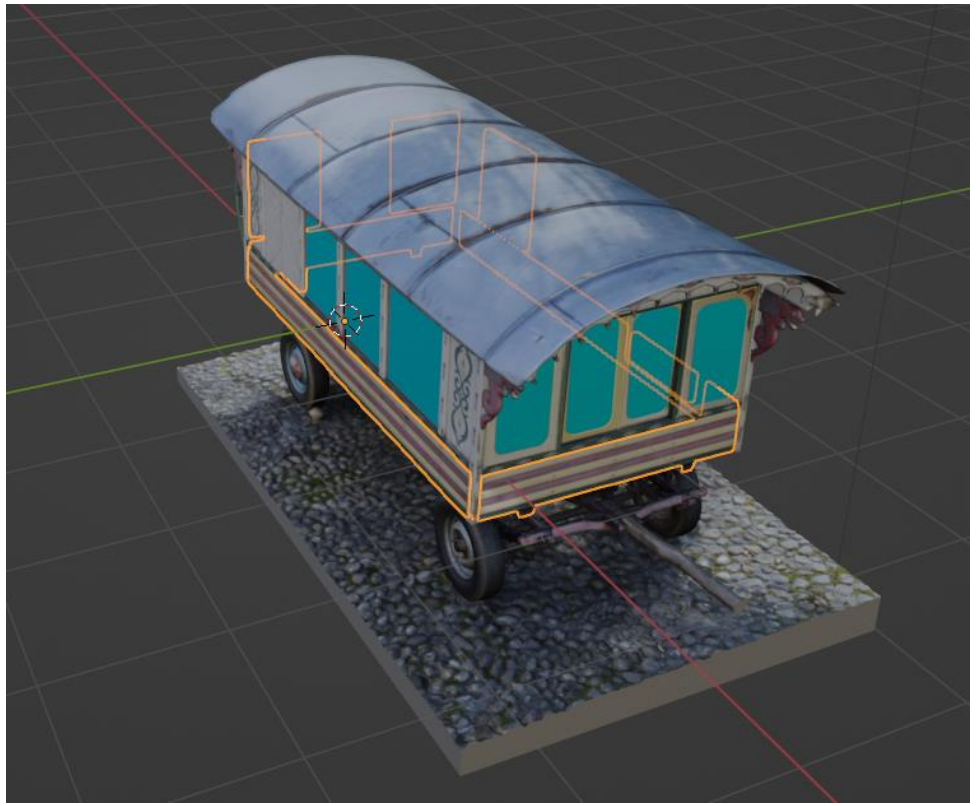
Sketchfab → OBJ → Cleaning → OBJ



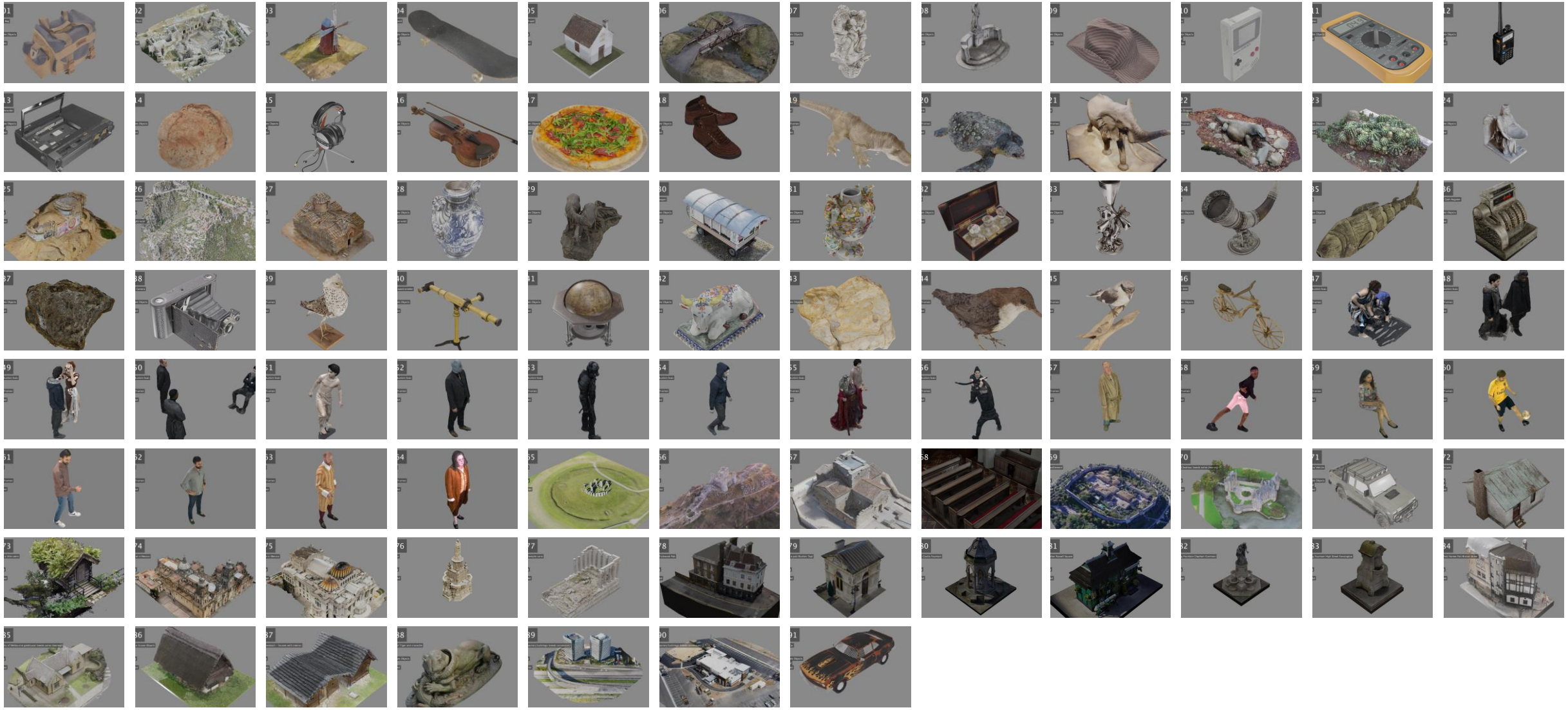
Collecting 3D models

VSENSE | **XD Productions** | **???**

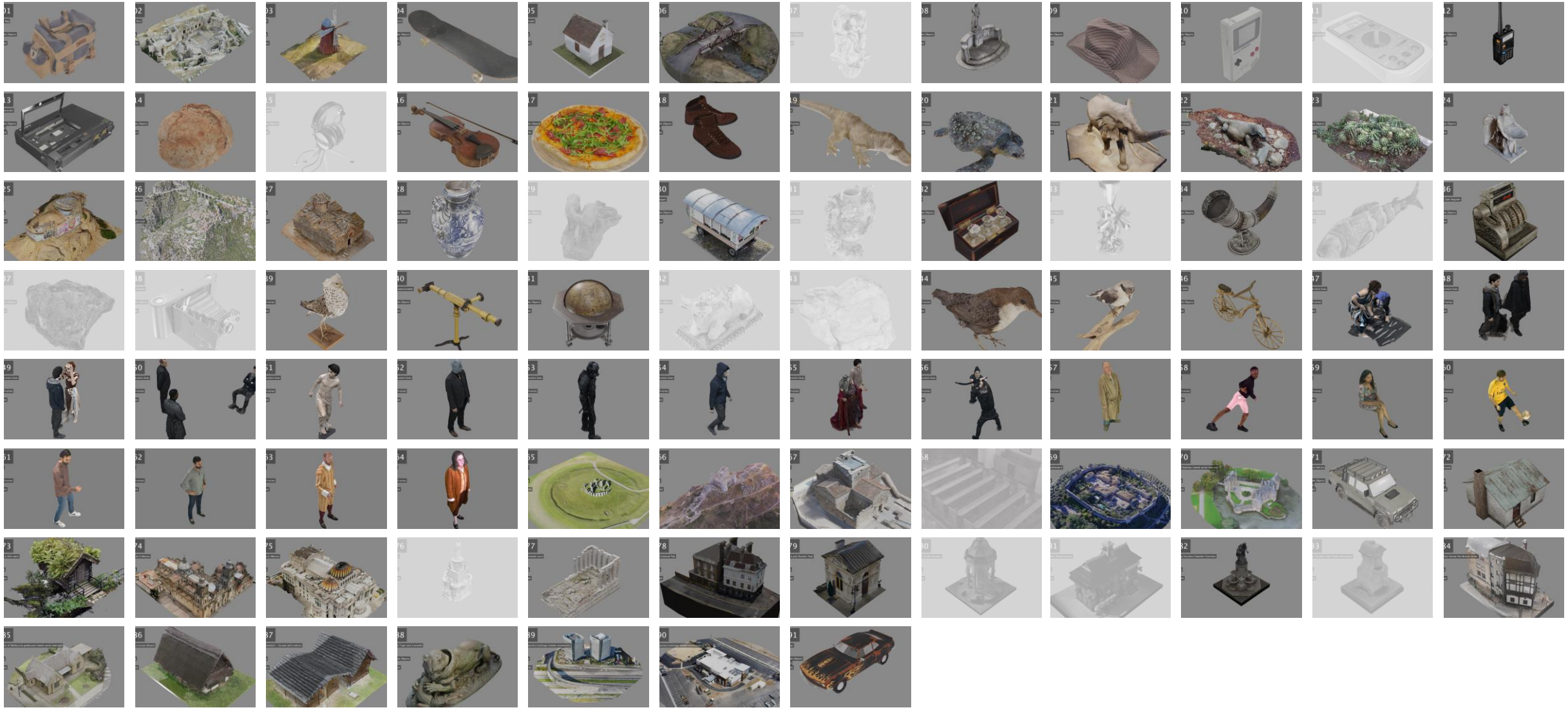




Initial collection – 91 models



Initial collection – 91 models



Initial collection – 91 models

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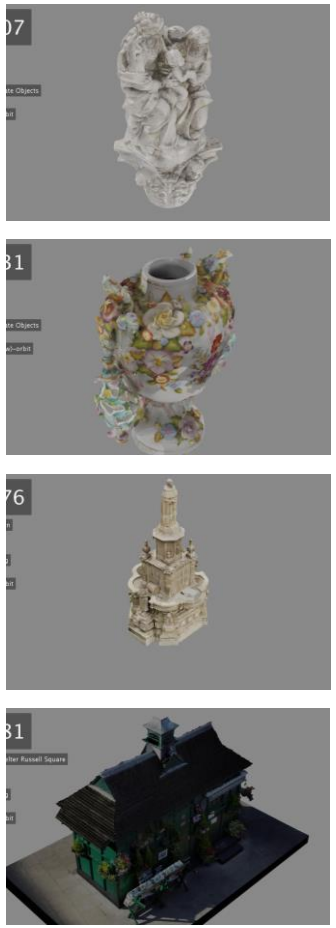
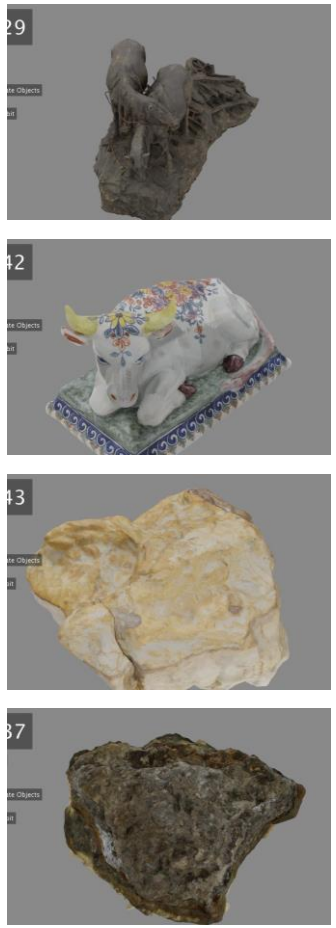
Excluded for practical concerns

Duplicates Similars exist

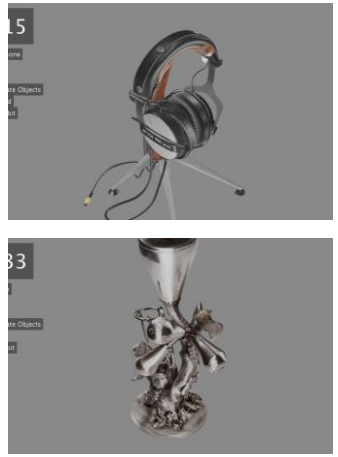


Not interesting or relevant

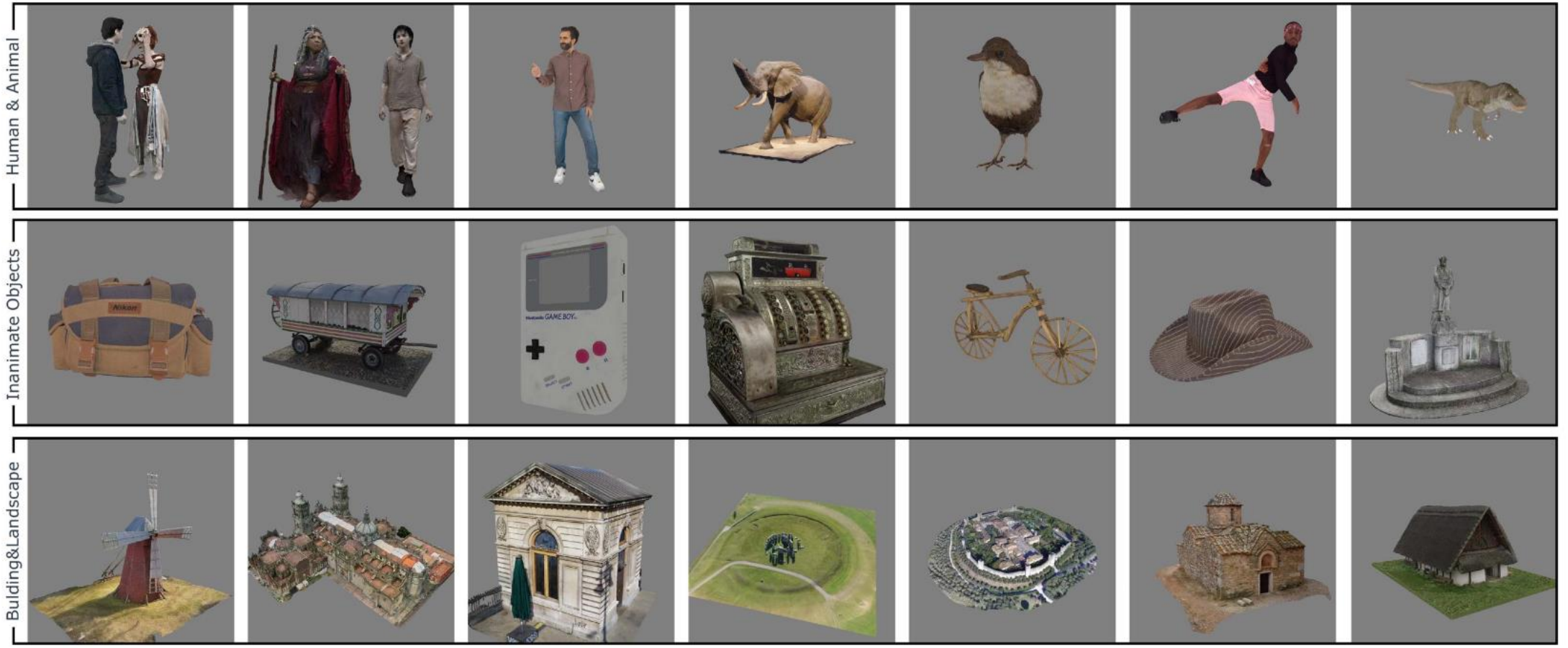


Indoor

Metallicness cannot be reproduced



Set of selected 75 point clouds (visual not exhaustive)



Point cloud processing chain

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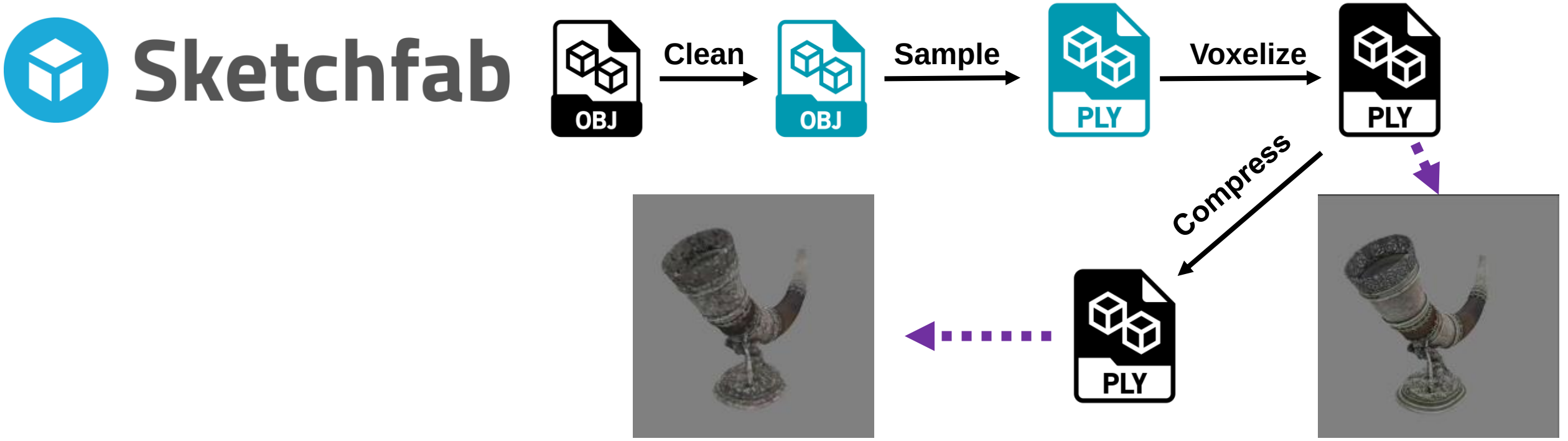
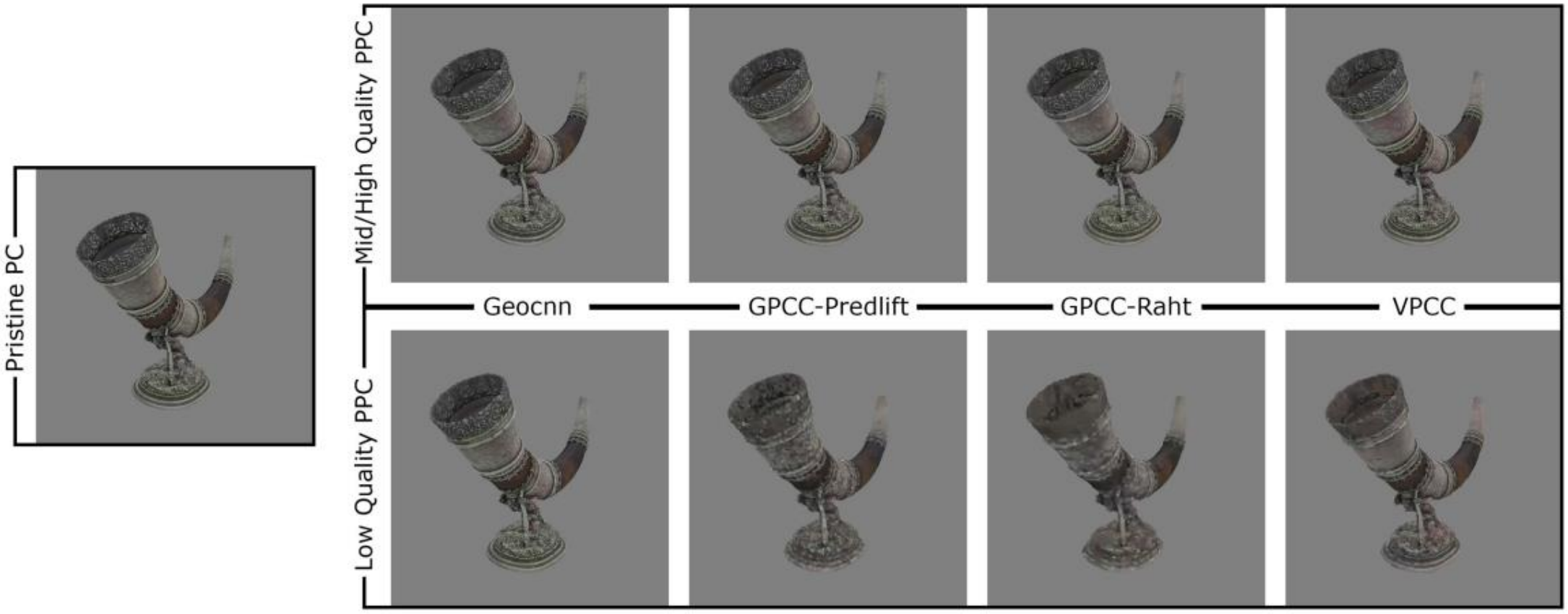
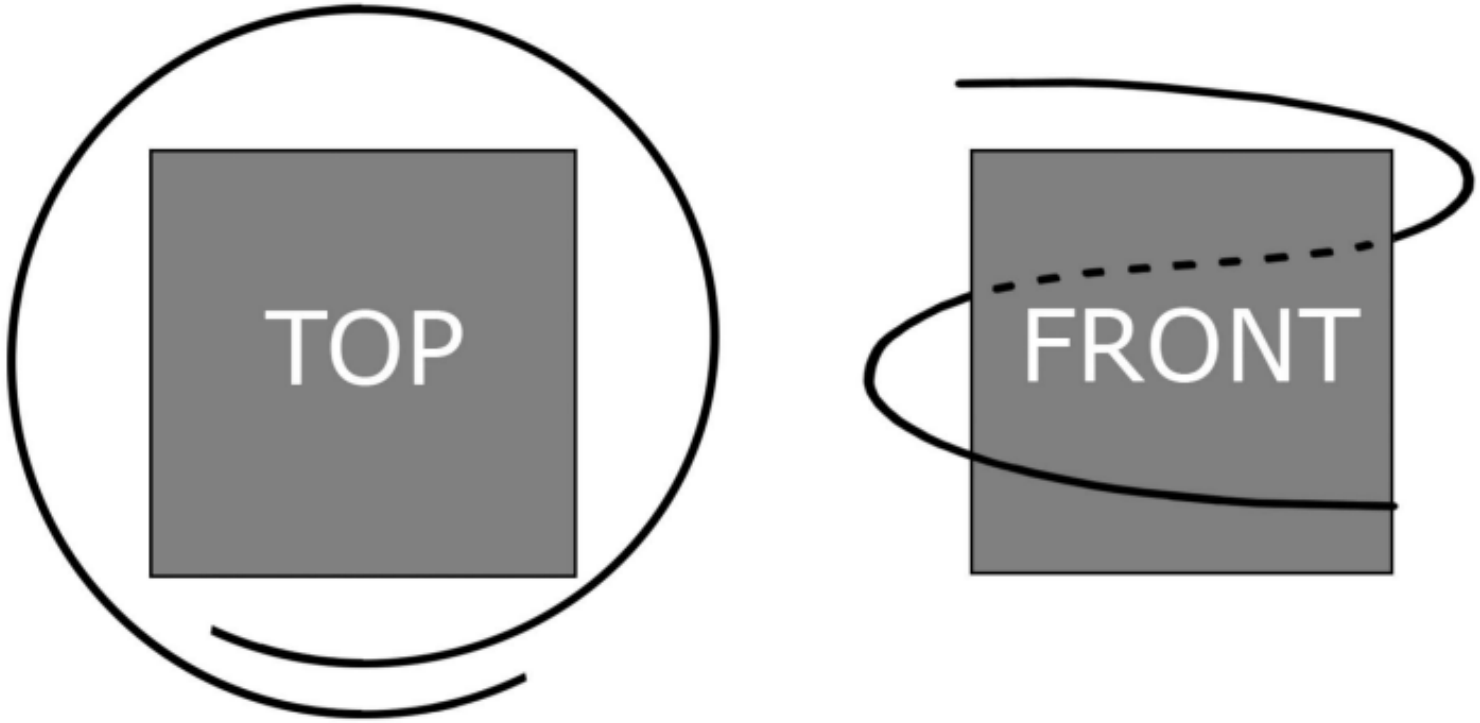


Point cloud processing chain

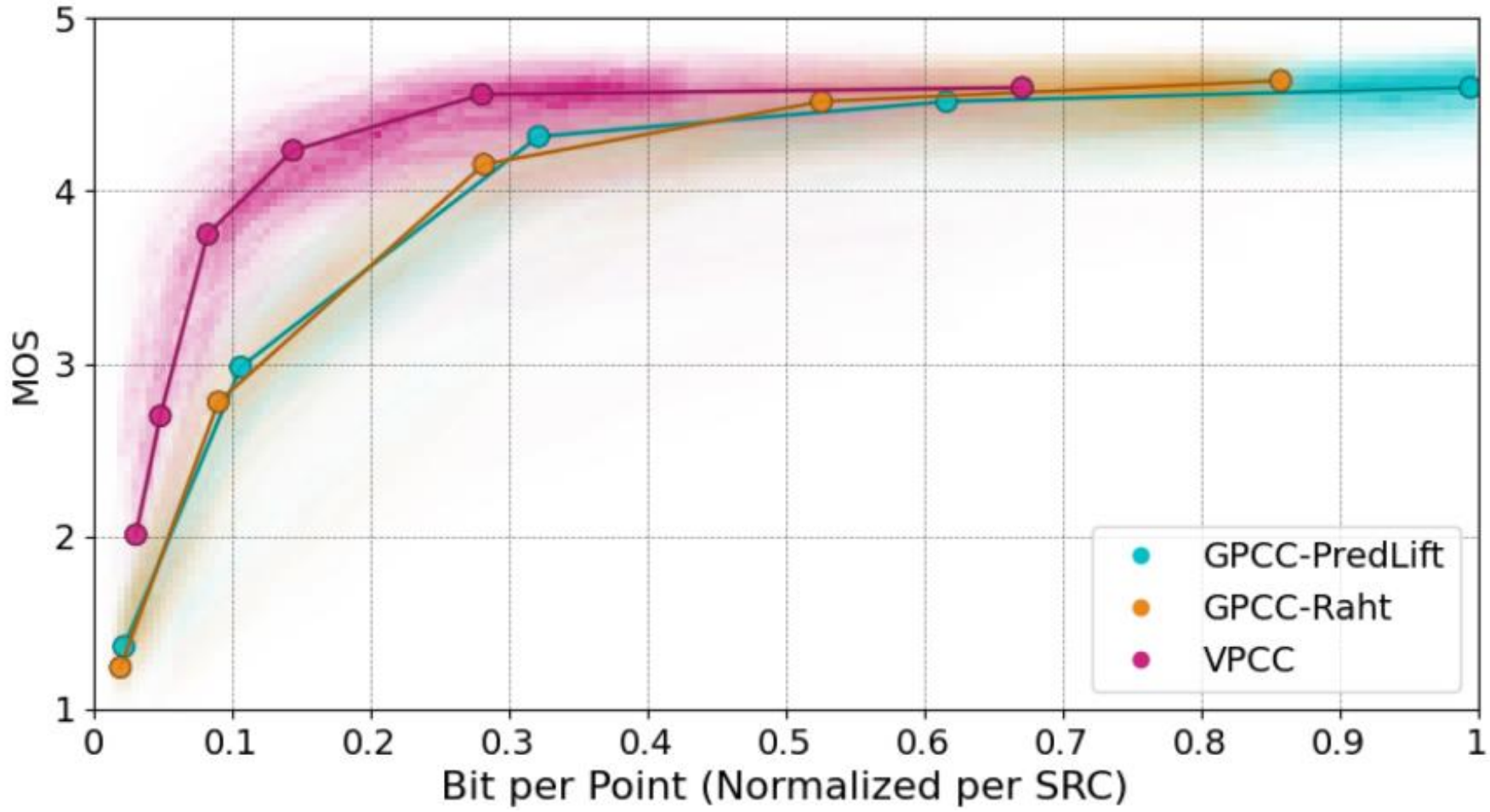


Preparing for the subjective QA

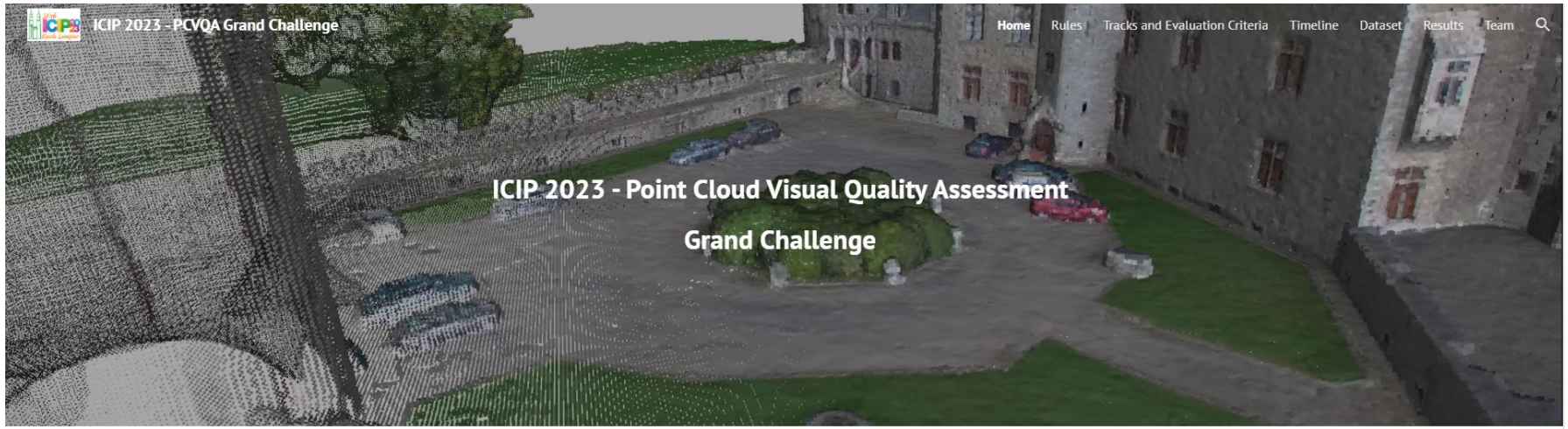


Preparing for the subjective QA

Subjective QA results



ICIP 23 Grand Challenge



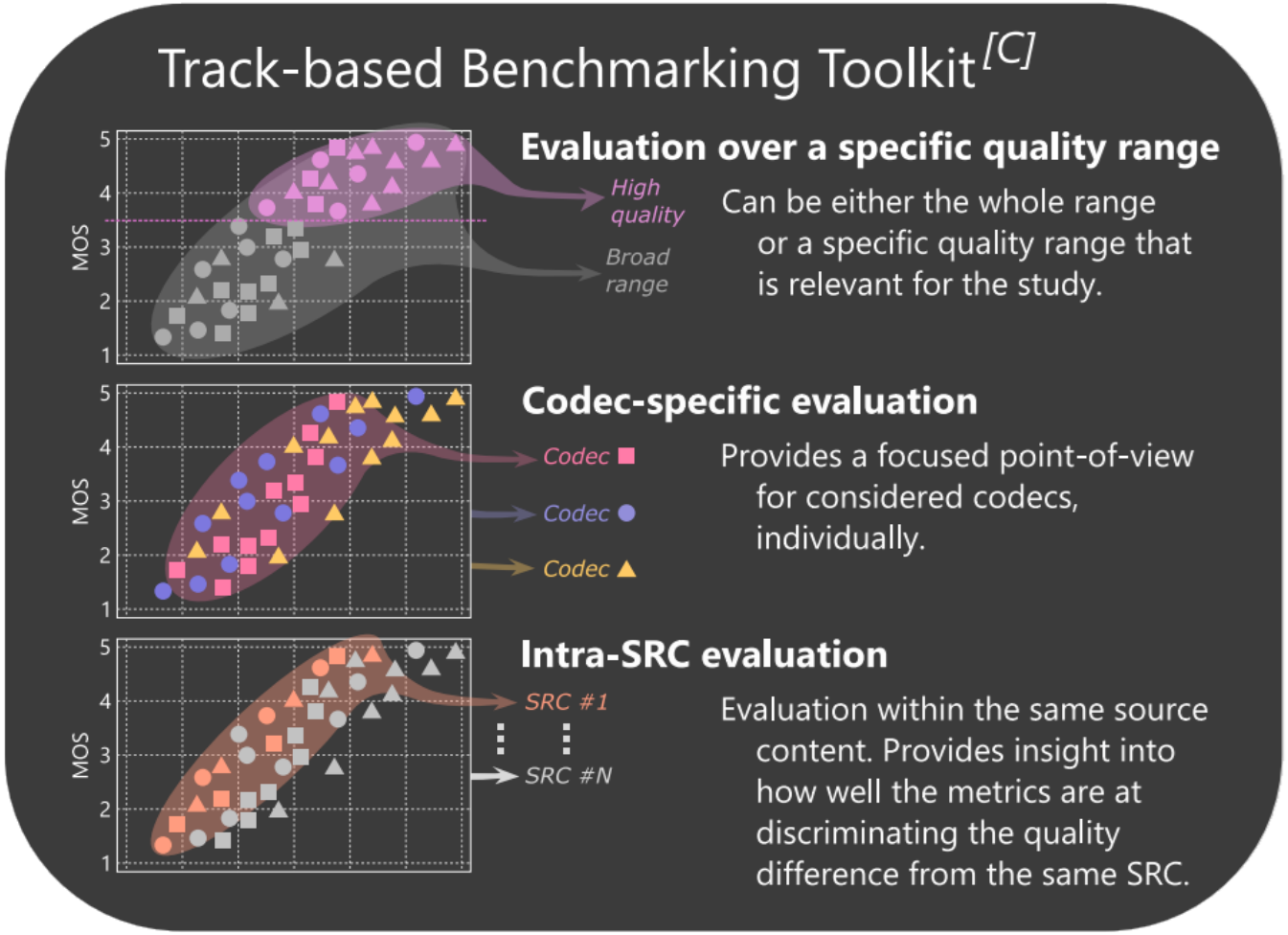
Click here to see the final results!

Description

Point cloud (PC) is an essential data format for the transmission and storage of immersive visual content and 3D visual data. They are employed in various applications, including virtual and mixed reality, autonomous driving, construction, cultural heritage, etc. Point clouds represent 3D data as a set of points with (x,y,z) coordinates, also referred to as the point cloud *geometry*, and associated *attributes*, such as colors, normals, and reflectance. Furthermore, depending on whether the PC includes a temporal dimension, we can further distinguish between *static* and *dynamic* point clouds.

The number of points in a PC can easily range in the order of millions and can feature complex attributes. To deal with the significant transmission bandwidth and storage space required by point clouds, a significant amount of work has been done to develop efficient point cloud compression (PCC) tools in the past

ICIP 23 Grand Challenge – Track based evaluation



Ak, A., Zerman, E., Quach, M., Chetouani, A., Valenzise, G., & Le Callet, P. (2024, October). **A toolkit to benchmark point cloud quality metrics with multi-track evaluation criteria**. In *2024 IEEE International Conference on Image Processing (ICIP 2024)*.

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Check the database:

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Discussion Point:

How can we ensure a "good" distribution of the source contents in database creation?