

## Asset creation for synthetic data production

3D assets are the building blocks of virtual environments for simulation and synthetic data production. Whereas novel methods such as NERFs [1] propagate an efficient extraction of geometries, an automated creation of segmentations, sensor materials and relevant metadata for synthetic data and ground truth production is not yet possible. Project-relevant asset dependencies are listed in table 1.

Asset feature	Dependency
Geometry	Scale, realism
Materials/textures	Sensor fidelity
Position/origin	Autoplacement, seeding
Normals	Raytracing, autolabeling, ground truth
Polygon count	Render time
Format	Compatibility, material strategy
Mesh organization	Autolabeling, material updates
Meta data	Semantic information, ground truth

Table 1: Asset features and corresponding dependencies for the project toolchain and synthetic data production.

## The creation process

The dependencies impose strict rules, that are funneled into project specifications. The following steps explore the asset creation process of a cigarette machine in adherence to said specifications.

### Step 1: Survey & reference photos

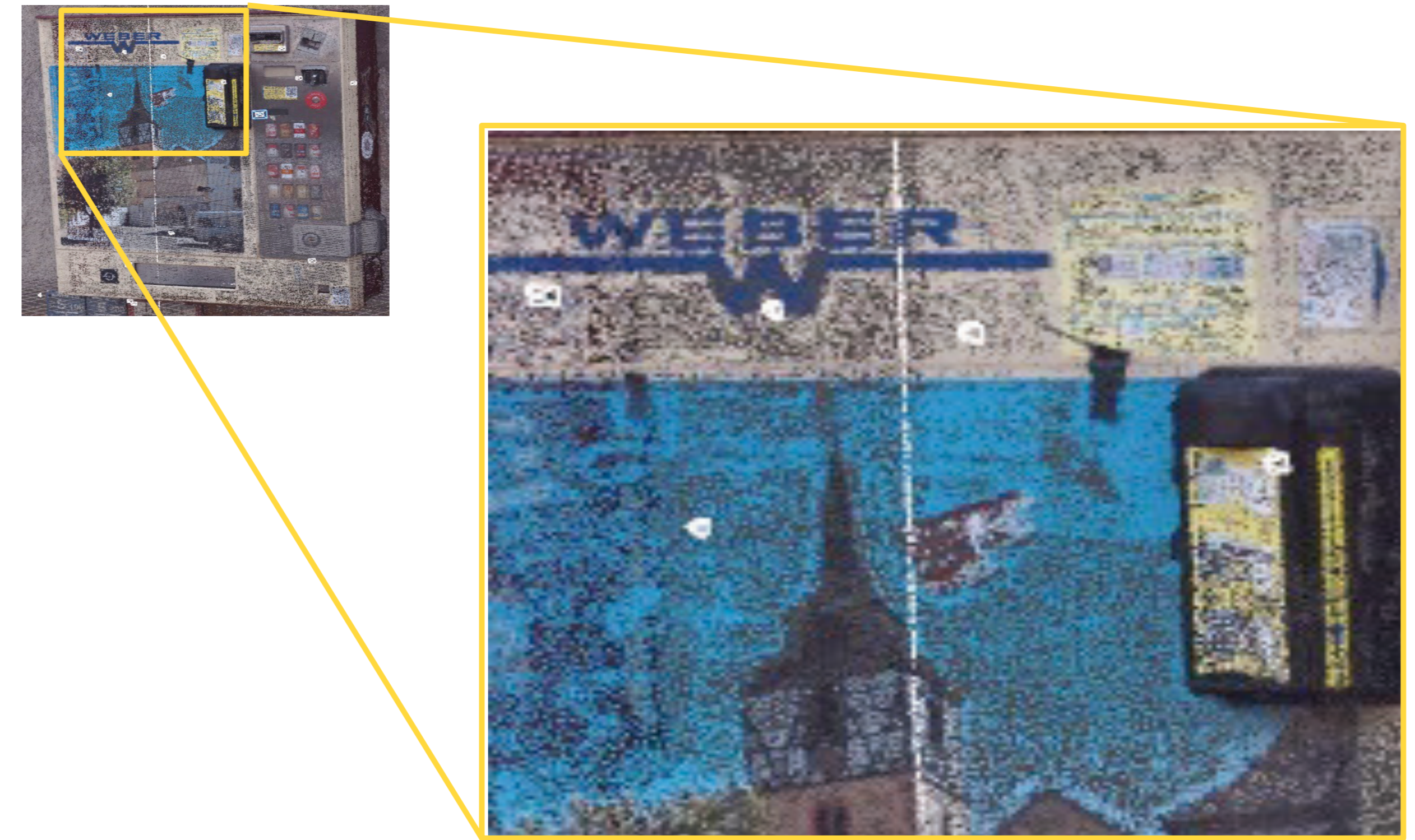
- Capture of the desired asset from different angles (20-40 photos)
- Shoot the asset in "neutral light" without light effects" such as direct sunlight or cast shadows or wetness
- Measurement of original dimensions (height/width/depth to define general scaling)



### Step 2: Photogrammetry

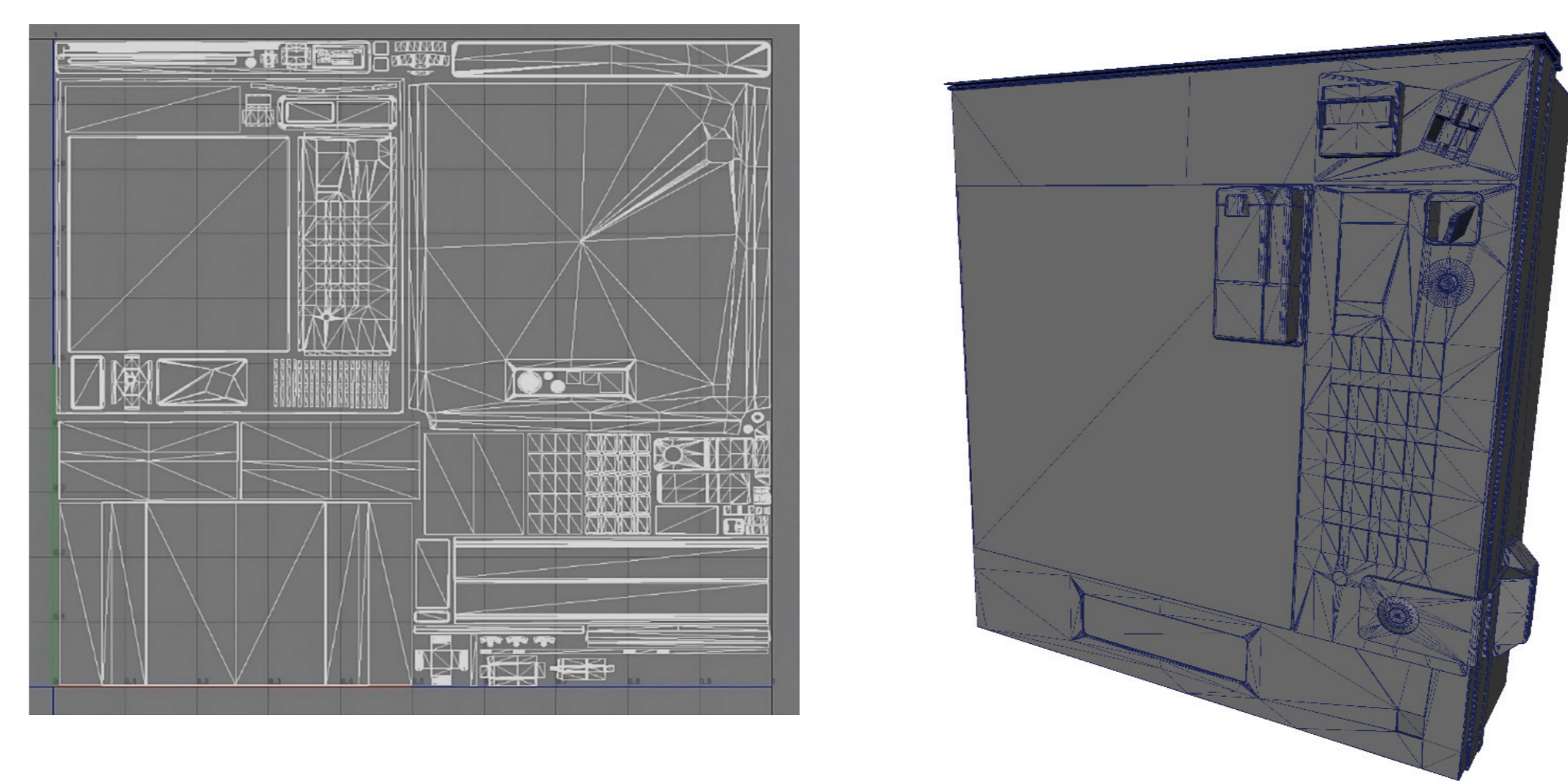
- Evaluation of all images to create a point cloud of the asset

- Creation of a preliminary HiRes model with temp. textures (approx. 1.5 mio polygons)



### Step 3: Specification adjustment

- Remodeling of a LowRes geometry using HiRes photogrammetry geometry
- Reduction to 22000 polygons
- Adjustment of model coordinates
- Creation and layout of texture coordinates



### Step 4: Material creation

- Creation of PBR materials and final textures

### Step 5: Quality assurance

- Normal alignment
- Mesh/material/mapping
- Mesh organization
- Meta data

### Step 5: Export & project material addition

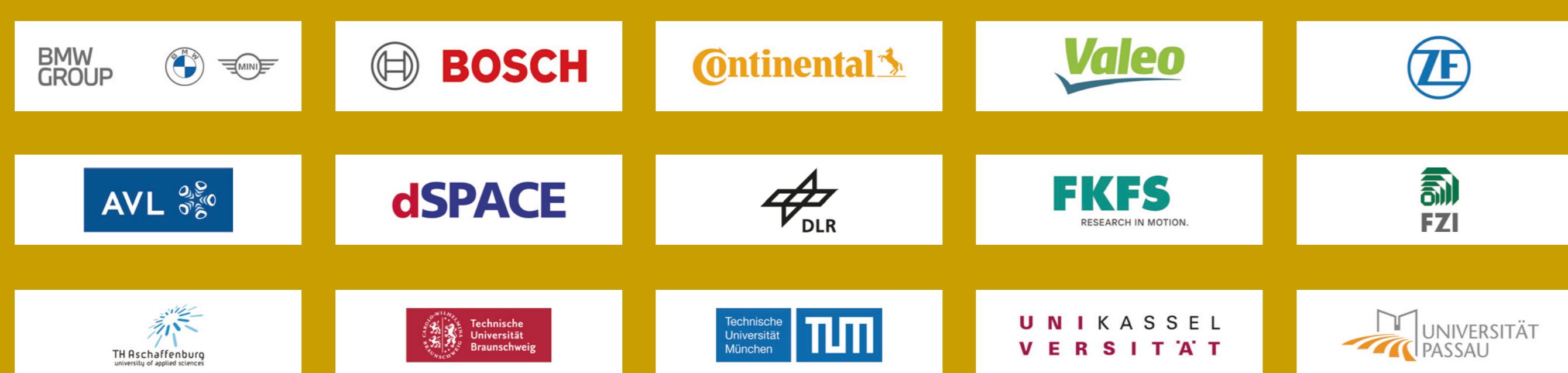
- Export of the final model as glTF
- Extension of the glTF model by "OpenMaterialReferenceLink" to add additionally measured radar and lidar material attributes



## References:

[1] Mildenhall, Ben, et al. "NeRF: Representing Scenes as Neural Radiance Fields for View Synthesis." arXiv:2003.08934v2 [cs.CV]. 2020

## Partners



## External partners



## For more information contact:

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