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Selecting texture resolution using a task-specific visibility metric Suplemental material

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In section 1 we present addtional results on accuracy evaluation. Section 2 demonstrates an improvement of visibility map as a result of our methodology. Section 3 explains how mipmapping was handled to prevent interfering with the results. Section 4 contains additional results for optimizing texture resolution in a 3D game-engine scenario. Finally, Section 5 consists of the UE4 projects links used for dataset creation.

1. Accuracy evaluation for different threshold values

In the paper we considered the selected threshold of 0.2 as a good compromise between the artifact visibility and texture resolution. However, a different threshold could be used for different applications. We computed the results for thresholds of 0.1 and 0.3 to confirm that our retuned metrics perform better also for these thresholds:

- for the threshold of 0.1 - MAE of 130.6 for CNN-T-CNN-GP-P93 as compared to 185.5 for VDP-P94 (Figure 1 - top);
- for the threshold of 0.3 - MAE of 110.3 of CNN-T-CNN-GP-P93 as compared to 169.4 for VDP-P94 (Figure 1 - bottom).

2. Visibility maps improvement

In Figure 2 we show examples of visibility map improvement. In the following columns the distorted image, reference image, human marking, results of general-purpose CNN-GP metric, and results of retuned metric CNN-T-HDR-VDP-P94 are presented. We chose CNN-T-HDR-VDP-P94 as it achieved the best average Loss score according to the Table 1 in the paper. For scenes *Barbarous*, *Bear*, *Couch*, and *Giant* the correct reduction of probability in the map can be observed. For all mentioned scene the results of general-purpose metric overpredict the probability comparing to human marking. Such behavior is not present in the maps generated by retuned metric. In the case of *Outlet* scene, the improper behavior might be observed where the probability was decreased too much in the central part of the image (four circular dents). In some cases, like *Robot* scene, retuning causes proper probability reduction in some parts (arms and body) and a too strong reduction in others (circular part on top of the robot). This effect might be due to the fact that probability adjustment is not done per pixel, but for a value pooled from the whole map.

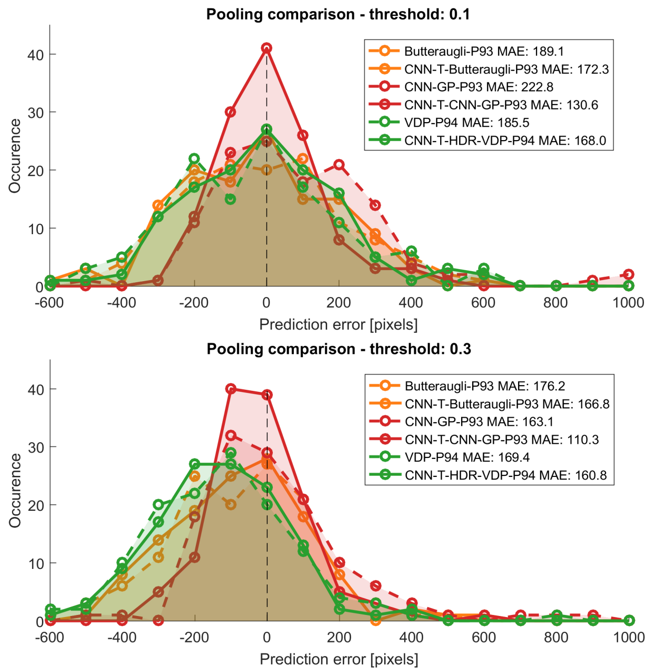


Figure 1: *The error distribution for the retuned and existing metrics for threshold 0.1 (top) and 0.3 (bottom). The prediction error in histograms is expressed as signed texture resolution differences (both horizontal and vertical) in pixel units with respect to the experimental data. The value in the legend denote mean-absolute-error (MAE).*

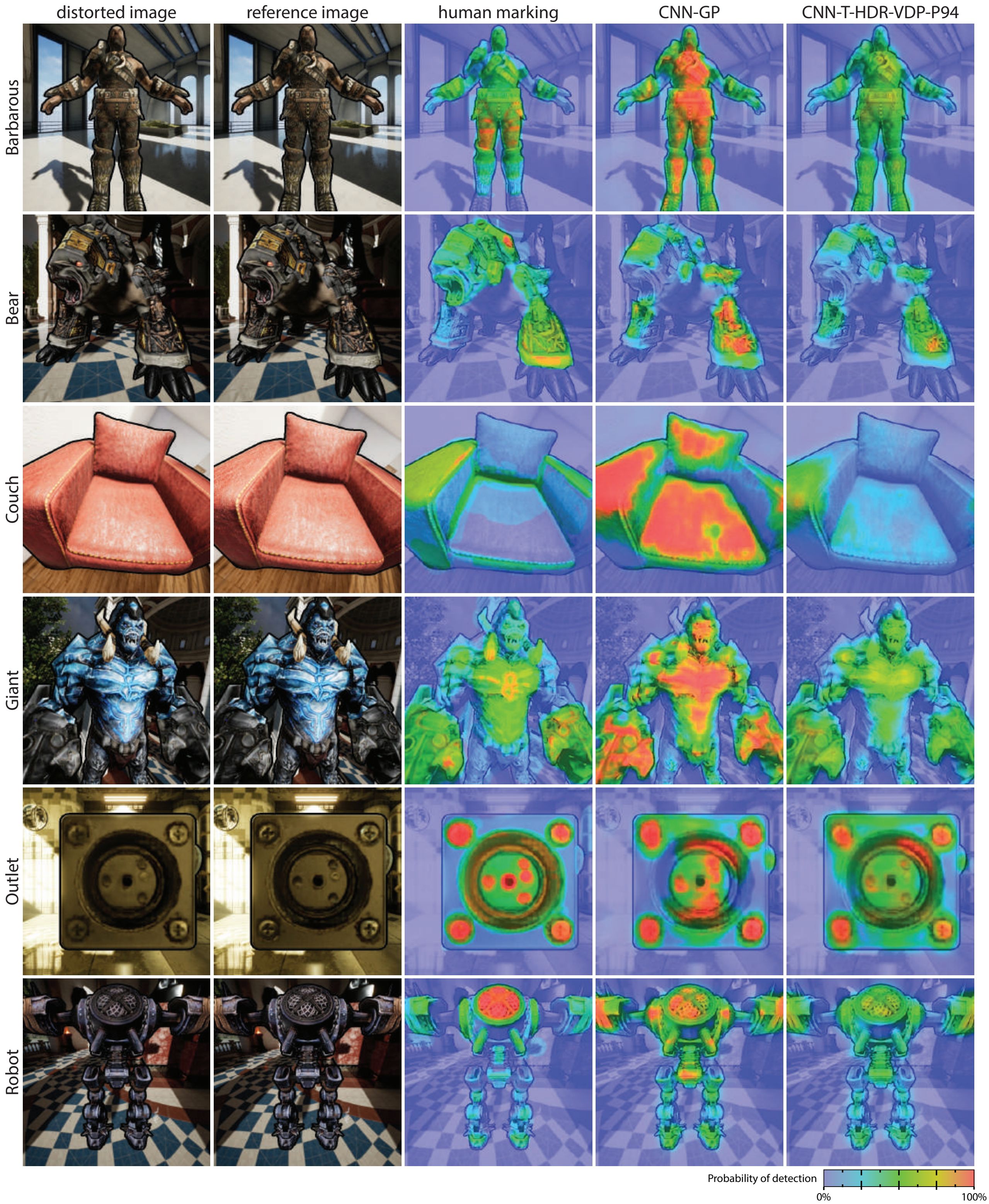


Figure 2: *Examples of visibility map alteration. In the first four rows the retuned metric (CNN-T-HDR-VDP-P94) reduced the probability in the correct way, providing visibility maps much closer to the human marking than general-purpose metric (CNN-GP). In the second last row the retuned metric reduced the probability in the incorrect way (circular dents in the center of the image). The last row presents correct probability reduction (arms and body of the robot) and incorrect reduction (head of the robot).*

3. Mipmapping

To prepare the dataset, we used a popular platform for the development of computer games — Unreal Engine 4 (UE4). We used UE4 to render for each scene a set of 51 images, each image using a texture resolution ranging from 24 pixels to 1024 pixels (width and height) with the step of 24. Because UE4 doesn't support non-power-of-two textures with mipmapping enabled, we had to switch mipmapping off.

The lack of mipmapping can potentially cause aliasing in the regions where higher mipmap level (lower-resolution texture) should be used. However, to avoid this, we ensured that most of the rendered pixels use the highest-resolution mipmap level. This is illustrated in the third column in Figure 3, in which red color denotes the highest resolution mipmap level. In the first and second column of Figure 3 we show that the differences between rendering with and without mipmapping are essentially invisible in a side-by-side comparison. Moreover, if we compare the mipmap visualization with human marking (collected in experiment 2), the highest probability of marking distortions is associated with areas where no mipmapping is needed (red color). This indicates that observers were not sensitive to aliasing.

4. Texture size selection - additional results

Figures 4 to 7 show different 3D objects (columns) rendered from different viewpoints (rows). The table to the right of each image shows the associated probability of detection values for different combinations of albedo and normal texture resolution. Table 1 shows saving in texture size and memory we achieve for each 3D object.

Scene	Albedo [px]		Normal [px]		Memory [MB]	
	before	after	before	after	before	after
TreasureBox	1024	512	1024	512	8	2
Plant	1024	512	1024	128	8	1.1
King	1024	1024	1024	1024	8	8
AngelStatue	1024	512	1024	512	8	2
FireCrucible	1024	512	1024	256	8	1.2
LargeRock	1024	1024	1024	512	8	5
ManStatue	1024	512	1024	256	8	1.2
Minecart	1024	1024	1024	256	8	4.2
PillarArch	1024	512	1024	256	8	1.2
SharpeningStone	1024	512	1024	256	8	1.2
TrackScaffold	1024	512	1024	256	8	1.2
DeamonDoor	1024	256	1024	128	8	0.3

Table 1: *The texture size reductions guided by the proposed metric and the corresponding memory savings. The resolution reported for the scenes shown in Figures 4 to 7.*

5. Assets source

Following asset packs were used to create our dataset:

- Infinity Blade: Adversaries (`https://www.unrealengine.com/marketplace/en-US/slug/infinity-blade-enemies`) - used for scenes: Bear, Chicken, Clotworm, Giant, Robot, Spider, Grunt, Troll, King.
- Infinity Blade: Warriors (`https://www.unrealengine.com/marketplace/en-US/slug/infinity-blade-characters`) - used for scenes: Cardboard, Golden, Troll, Wolf, Bladed, Shell, Solid, Standard, Warrior.
- Infinity Blade: Fire Lands (`https://www.unrealengine.com/marketplace/en-US/slug/infinity-blade-fire-lands`) - used for scenes: FireCrucible, LargeRock, Minecart, PillarArch, SharpeningStone, TrackScaffold, TreasureBox, Breakable.
- Infinity Blade: Grass Lands (`https://www.unrealengine.com/marketplace/en-US/slug/infinity-blade-plain-lands`) - used for scenes: Fern, Plant, AngelStatue, DemonDoor, ManStatue, PillarArch.
- Example Project Welcome (included as default UnrealEngine sample) (`https://www.unrealengine.com/`) - used for scenes: HelmetKnight, WallLight.
- Shooter Game (included as default UnrealEngine sample) (`https://www.unrealengine.com/`) - used for scenes: Bench, Trashcan.
- Realistic Rendering (included as default UnrealEngine sample) (`https://www.unrealengine.com/`) - used for scenes: CeilingLight, Couch, Door, Shelving.
- Reflection (included as default UnrealEngine sample) (`https://www.unrealengine.com/`) - used for scenes: Outlet, Pipeclamp, Poster, Trashbag.
- Sun Temple (included as default UnrealEngine sample) (`https://www.unrealengine.com/`) - used for scenes: Railing, Rock, Shield, Statue.
- Epic Zen Garden (`https://www.unrealengine.com/marketplace/en-US/slug/epic-zen-garden`) - used for scenes: MarbleRock, Wood.

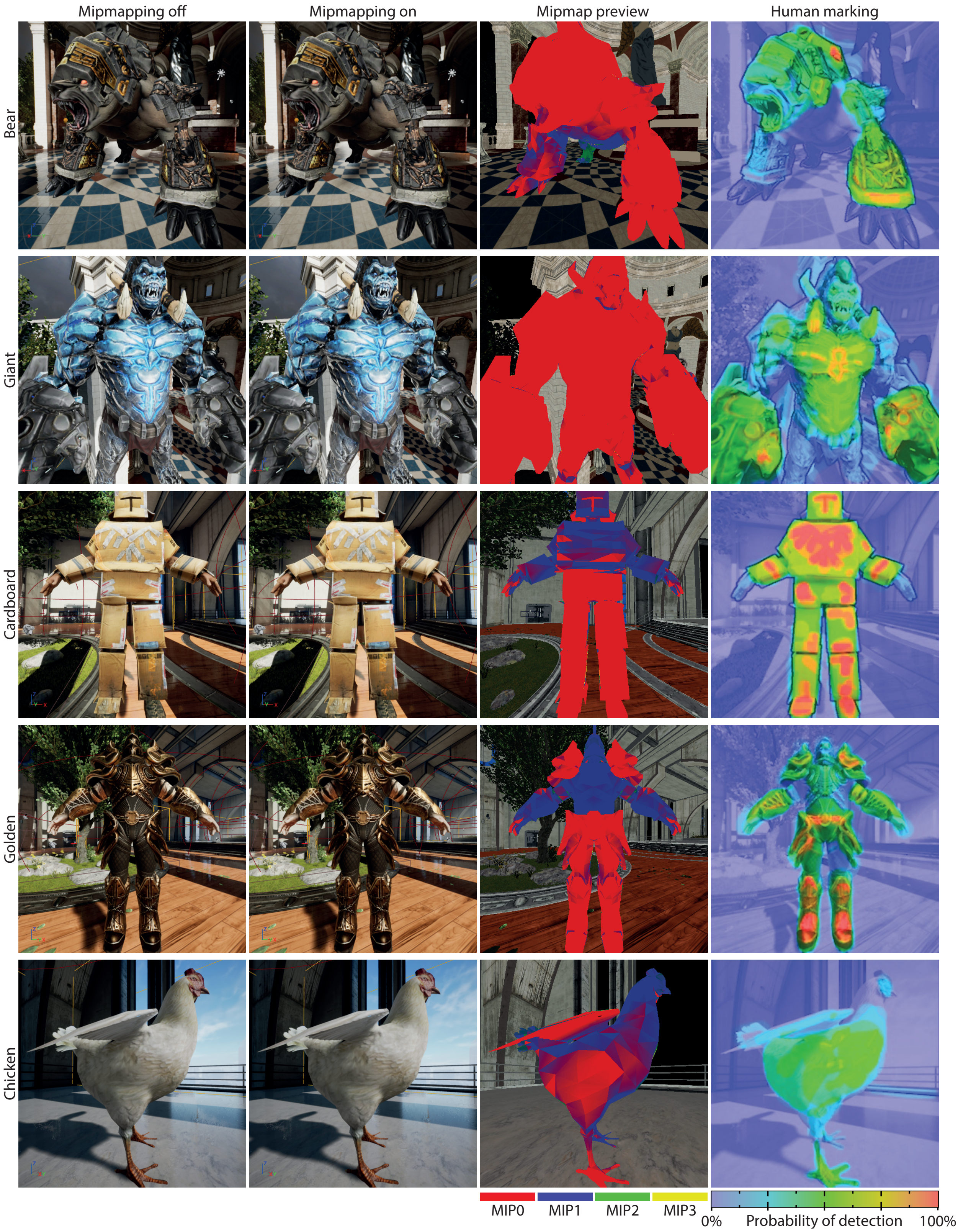
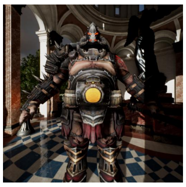


Figure 3: *Figure presents image render with mipmapping turned off, mipmapping turned on, mipmapping visualization and human marking in the following columns for six chosen scenes. Differences between the first and second column cannot be perceived in a side-by-side comparison. Most of the areas where the probability of artifact detection is high overlaps with the lowest mipmap level (areas where aliasing due to turned off mipmapping cannot occur).*

TreasureBox | Plant | King

Normal \ Albedo	1024	512	256	128	64
1024		0.08	0.64	0.98	1
512	0.01	0.11	0.69	0.98	1
256	0.04	0.21	0.78	0.99	1
128	0.44	0.64	0.92	1	1
64	0.92	0.96	0.99	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.03	0.39	0.94	1
512	0	0.04	0.44	0.95	1
256	0	0.06	0.49	0.96	1
128	0.02	0.13	0.58	0.96	1
64	0.06	0.25	0.69	0.97	1

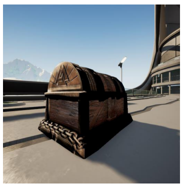


Normal \ Albedo	1024	512	256	128	64
1024		0.84	1	1	1
512	0.07	0.87	1	1	1
256	0.58	0.95	1	1	1
128	0.91	0.99	1	1	1
64	0.98	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.05	0.76	0.99	1
512	0.01	0.07	0.8	0.99	1
256	0.09	0.28	0.87	0.99	1
128	0.72	0.83	0.97	1	1
64	0.95	0.97	1	1	1

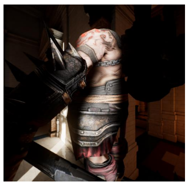
Normal \ Albedo	1024	512	256	128	64
1024		0.04	0.4	0.93	0.99
512	0	0.04	0.44	0.94	0.99
256	0	0.06	0.51	0.95	1
128	0.02	0.12	0.62	0.96	1
64	0.05	0.2	0.71	0.97	1

Normal \ Albedo	1024	512	256	128	64
1024		0.82	1	1	1
512	0.17	0.88	1	1	1
256	0.83	0.97	1	1	1
128	0.96	0.99	1	1	1
64	0.99	1	1	1	1



Normal \ Albedo	1024	512	256	128	64
1024		0.04	0.39	0.88	0.96
512	0	0.07	0.45	0.89	0.96
256	0.04	0.18	0.62	0.92	0.97
128	0.49	0.59	0.81	0.96	0.98
64	0.83	0.86	0.92	0.98	0.99

Normal \ Albedo	1024	512	256	128	64
1024		0.01	0.08	0.41	0.8
512	0	0.02	0.09	0.43	0.81
256	0	0.02	0.1	0.44	0.82
128	0.01	0.04	0.14	0.49	0.83
64	0.04	0.09	0.24	0.58	0.86



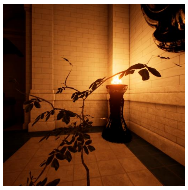
Normal \ Albedo	1024	512	256	128	64
1024		0.96	1	1	1
512	0.18	0.98	1	1	1
256	0.8	1	1	1	1
128	0.95	1	1	1	1
64	0.99	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.1	0.7	0.99	1
512	0.02	0.15	0.75	0.99	1
256	0.19	0.42	0.85	0.99	1
128	0.91	0.95	0.99	1	1
64	0.99	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.05	0.68	0.99	1
512	0	0.06	0.71	1	1
256	0.01	0.08	0.75	1	1
128	0.03	0.16	0.82	1	1
64	0.07	0.29	0.89	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.96	1	1	1
512	0.18	0.98	1	1	1
256	0.8	1	1	1	1
128	0.95	1	1	1	1
64	0.99	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.11	0.78	0.99	1
512	0.01	0.15	0.8	0.99	1
256	0.15	0.41	0.89	0.99	1
128	0.81	0.9	0.98	1	1
64	0.98	0.99	1	1	1

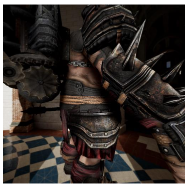


Normal \ Albedo	1024	512	256	128	64
1024		0.02	0.34	0.87	0.98
512	0	0.03	0.36	0.87	0.98
256	0	0.03	0.38	0.88	0.99
128	0	0.03	0.4	0.89	0.99
64	0	0.03	0.41	0.89	0.99

Normal \ Albedo	1024	512	256	128	64
1024		0.13	0.66	0.95	1
512	0.01	0.15	0.67	0.96	1
256	0.02	0.2	0.69	0.96	1
128	0.07	0.33	0.75	0.96	1
64	0.18	0.47	0.79	0.96	1

Normal \ Albedo	1024	512	256	128	64
1024		0.11	0.82	1	1
512	0.01	0.16	0.86	1	1
256	0.12	0.95	0.99	1	1
128	0.99	0.99	1	1	1
64	1	1	1	1	1

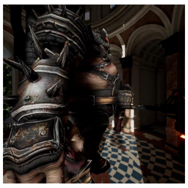
Normal \ Albedo	1024	512	256	128	64
1024		0.01	0.07	0.19	0.5
512	0	0.01	0.07	0.2	0.51
256	0	0.01	0.08	0.21	0.52
128	0	0.02	0.09	0.23	0.54
64	0.01	0.02	0.1	0.24	0.55



Normal \ Albedo	1024	512	256	128	64
1024		0.34	0.85	0.99	1
512	0.02	0.36	0.85	0.99	1
256	0.04	0.42	0.86	0.99	1
128	0.1	0.52	0.89	0.99	1
64	0.22	0.62	0.91	0.99	1

Normal \ Albedo	1024	512	256	128	64
1024		0.11	0.7	0.99	1
512	0.02	0.16	0.75	0.99	1
256	0.18	0.44	0.89	1	1
128	0.89	0.95	0.99	1	1
64	1	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.01	0.09	0.41	0.82
512	0	0.01	0.11	0.43	0.83
256	0	0.01	0.12	0.45	0.84
128	0	0.02	0.14	0.47	0.85
64	0	0.02	0.16	0.51	0.86



Normal \ Albedo	1024	512	256	128	64
1024		0.98	1	1	1
512	0.36	0.99	1	1	1
256	0.82	1	1	1	1
128	0.94	1	1	1	1
64	0.97	1	1	1	1

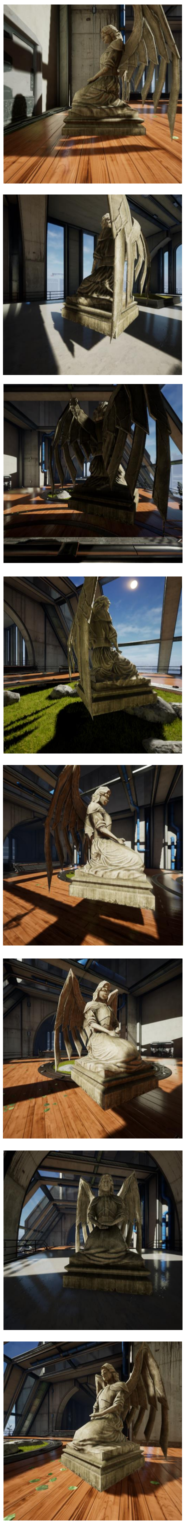
Normal \ Albedo	1024	512	256	128	64
1024		0.02	0.4	0.94	0.99
512	0.01	0.02	0.42	0.95	0.99
256	0.02	0.05	0.82	0.98	1
128	0.55	0.71	0.88	0.99	1
64	0.81	0.87	0.95	0.99	1

Normal \ Albedo	1024	512	256	128	64
1024		0.02	0.15	0.66	0.95
512	0	0.02	0.17	0.69	0.96
256	0	0.03	0.2	0.71	0.96
128	0.01	0.05	0.25	0.78	0.96
64	0.04	0.11	0.37	0.84	0.97

Normal \ Albedo	1024	512	256	128	64
1024		1	1	1	1
512	0.25	1	1	1	1
256	0.67	1	1	1	1
128	0.91	1	1	1	1
64	0.95	1	1	1	1

Figure 4: *Examples of 8 views rendered using reference texture (rows) and the corresponding metric predictions for all combinations of normal and albedo texture resolutions. The columns in the tables represent variation in the albedo map resolution, and the rows the variation in the normal map resolution. The color coding represents the probability of detection, from 0 (green, invisible) to 1 (red, definitely visible).*

AngelStatue



Normal \ Albedo	1024	512	256	128	64
1024		0.05	0.53	0.94	0.98
512	0.01	0.07	0.56	0.94	0.98
256	0.04	0.15	0.66	0.95	0.98
128	0.18	0.35	0.76	0.96	0.99
64	0.62	0.73	0.91	0.98	0.99

Normal \ Albedo	1024	512	256	128	64
1024		0.09	0.68	0.94	0.98
512	0.01	0.13	0.71	0.94	0.98
256	0.06	0.27	0.75	0.95	0.98
128	0.2	0.44	0.82	0.96	0.99
64	0.47	0.69	0.91	0.98	0.99

Normal \ Albedo	1024	512	256	128	64
1024		0.02	0.16	0.44	0.62
512	0	0.02	0.16	0.44	0.63
256	0.02	0.05	0.19	0.47	0.64
128	0.11	0.16	0.35	0.6	0.72
64	0.3	0.38	0.54	0.73	0.82

Normal \ Albedo	1024	512	256	128	64
1024		0.05	0.42	0.87	0.96
512	0	0.05	0.43	0.87	0.96
256	0.02	0.07	0.46	0.89	0.96
128	0.14	0.22	0.58	0.91	0.97
64	0.48	0.6	0.82	0.96	0.98

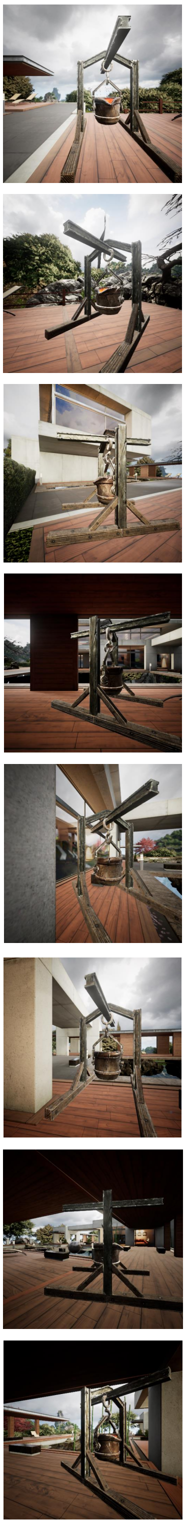
Normal \ Albedo	1024	512	256	128	64
1024		0.05	0.82	0.99	1
512	0	0.07	0.83	0.99	1
256	0.03	0.17	0.86	0.99	1
128	0.26	0.64	0.96	1	1
64	0.78	0.93	0.99	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.02	0.39	0.91	0.98
512	0	0.03	0.42	0.92	0.98
256	0.02	0.06	0.47	0.92	0.98
128	0.18	0.33	0.71	0.95	0.98
64	0.62	0.73	0.89	0.98	1

Normal \ Albedo	1024	512	256	128	64
1024		0.03	0.56	0.93	0.97
512	0.01	0.04	0.59	0.93	0.97
256	0.02	0.06	0.63	0.93	0.97
128	0.09	0.2	0.75	0.95	0.98
64	0.32	0.47	0.83	0.96	0.98

Normal \ Albedo	1024	512	256	128	64
1024		0.03	0.43	0.93	0.99
512	0.01	0.05	0.45	0.93	0.99
256	0.04	0.12	0.49	0.95	0.99
128	0.19	0.35	0.71	0.96	0.99
64	0.56	0.69	0.85	0.98	1

FireCrucible



Normal \ Albedo	1024	512	256	128	64
1024		0.02	0.11	0.56	0.9
512	0.01	0.02	0.11	0.59	0.9
256	0.02	0.04	0.15	0.61	0.91
128	0.07	0.15	0.3	0.73	0.93
64	0.24	0.32	0.55	0.85	0.96

Normal \ Albedo	1024	512	256	128	64
1024		0.02	0.05	0.3	0.71
512	0.01	0.02	0.06	0.32	0.73
256	0.02	0.02	0.08	0.36	0.74
128	0.05	0.09	0.17	0.48	0.78
64	0.12	0.18	0.33	0.61	0.84

Normal \ Albedo	1024	512	256	128	64
1024		0.05	0.44	0.97	1
512	0.02	0.07	0.47	0.97	1
256	0.03	0.11	0.58	0.97	1
128	0.17	0.4	0.78	0.98	1
64	0.49	0.68	0.9	0.99	1

Normal \ Albedo	1024	512	256	128	64
1024		0.04	0.13	0.62	0.89
512	0.01	0.05	0.14	0.65	0.89
256	0.04	0.08	0.2	0.69	0.91
128	0.15	0.25	0.46	0.84	0.94
64	0.36	0.5	0.72	0.93	0.96

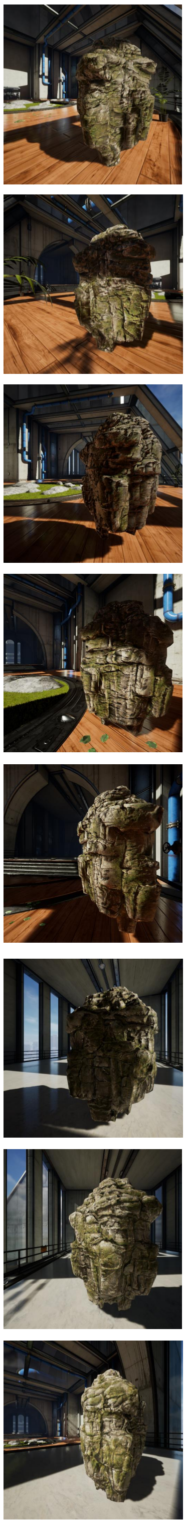
Normal \ Albedo	1024	512	256	128	64
1024		0.04	0.16	0.72	0.96
512	0.01	0.04	0.18	0.73	0.96
256	0.01	0.05	0.19	0.75	0.96
128	0.04	0.08	0.25	0.79	0.96
64	0.08	0.14	0.33	0.85	0.97

Normal \ Albedo	1024	512	256	128	64
1024		0.04	0.16	0.7	0.93
512	0.01	0.05	0.18	0.73	0.93
256	0.02	0.07	0.22	0.75	0.93
128	0.09	0.16	0.37	0.84	0.95
64	0.24	0.33	0.57	0.89	0.96

Normal \ Albedo	1024	512	256	128	64
1024		0.03	0.11	0.62	0.83
512	0.01	0.04	0.11	0.64	0.84
256	0.02	0.06	0.15	0.68	0.84
128	0.08	0.14	0.27	0.77	0.85
64	0.16	0.26	0.44	0.83	0.87

Normal \ Albedo	1024	512	256	128	64
1024		0.03	0.12	0.56	0.84
512	0.01	0.03	0.13	0.57	0.84
256	0.02	0.05	0.17	0.61	0.86
128	0.11	0.18	0.34	0.75	0.9
64	0.31	0.4	0.55	0.82	0.93

LargeRock



Normal \ Albedo	1024	512	256	128	64
1024		0.07	0.67	0.99	1
512	0.02	0.11	0.74	1	1
256	0.19	0.44	0.88	1	1
128	0.93	0.96	0.99	1	1
64	0.99	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.09	0.78	0.99	1
512	0.01	0.13	0.82	0.99	1
256	0.12	0.37	0.92	1	1
128	0.73	0.89	0.99	1	1
64	0.97	0.99	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.1	0.71	0.96	0.99
512	0.02	0.18	0.77	0.97	0.99
256	0.31	0.54	0.91	0.98	1
128	0.93	0.96	0.98	1	1
64	0.99	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.26	0.95	1	1
512	0	0.32	0.96	1	1
256	0.09	0.59	0.98	1	1
128	0.54	0.89	1	1	1
64	0.9	0.98	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.26	0.93	0.99	1
512	0.02	0.4	0.95	1	1
256	0.26	0.76	0.98	1	1
128	0.85	0.97	1	1	1
64	0.99	1	1	1	1

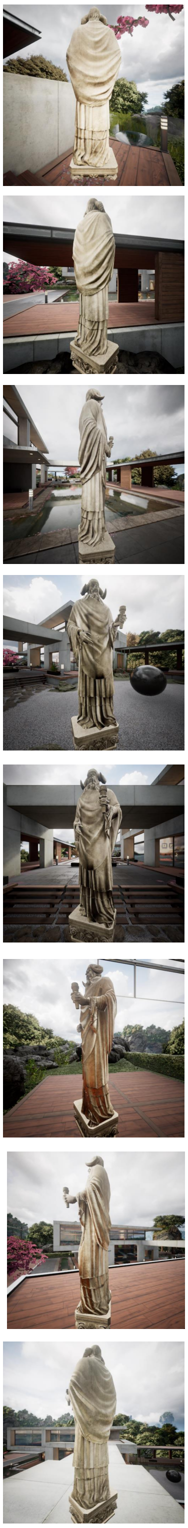
Normal \ Albedo	1024	512	256	128	64
1024		0.07	0.62	0.95	0.99
512	0.01	0.11	0.65	0.95	0.99
256	0.13	0.33	0.81	0.96	0.99
128	0.63	0.82	0.95	0.99	1
64	0.93	0.96	0.99	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.16	0.92	1	1
512	0.02	0.26	0.94	1	1
256	0.32	0.65	0.98	1	1
128	0.91	0.97	1	1	1
64	0.99	1	1	1	1

Normal \ Albedo	1024	512	256	128	64
1024		0.14	0.96	1	1
512	0.01	0.23	0.97	1	1
256	0.11	0.54	0.99	1	1
128	0.55	0.89	1	1	1
64	0.91	0.98	1	1	1

Figure 5: *Examples of 8 views rendered using reference texture (rows) and the corresponding metric predictions for all combinations of normal and albedo texture resolutions. The columns in the tables represent variation in the albedo map resolution, and the rows the variation in the normal map resolution. The color coding represents the probability of detection, from 0 (green, invisible) to 1 (red, definitely visible).*

ManStatue



Albedo / Normal	1024	512	256	128	64
1024		0.02	0.12	0.76	0.95
512	0.02	0.02	0.13	0.77	0.95
256	0.03	0.05	0.2	0.8	0.95
128	0.35	0.44	0.64	0.93	0.98
64	0.91	0.94	0.97	0.99	1

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.13	0.6	0.92
512	0.02	0.03	0.13	0.62	0.92
256	0.03	0.05	0.18	0.63	0.92
128	0.18	0.29	0.5	0.85	0.96
64	0.91	0.94	0.97	0.99	1

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.15	0.6	0.87
512	0.02	0.02	0.16	0.62	0.87
256	0.03	0.07	0.22	0.66	0.89
128	0.18	0.31	0.55	0.88	0.96
64	0.84	0.89	0.95	0.98	1

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.16	0.8	0.97
512	0.02	0.03	0.16	0.82	0.97
256	0.03	0.06	0.18	0.81	0.97
128	0.23	0.39	0.57	0.91	0.98
64	0.89	0.92	0.95	0.99	1

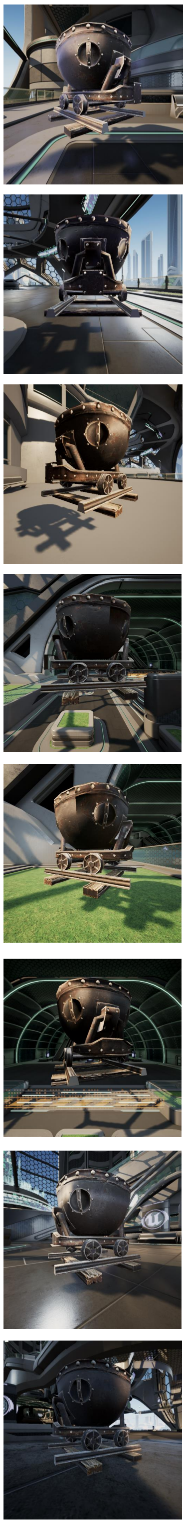
Albedo / Normal	1024	512	256	128	64
1024		0.02	0.15	0.75	0.96
512	0.01	0.02	0.16	0.76	0.96
256	0.03	0.05	0.19	0.76	0.96
128	0.25	0.38	0.55	0.87	0.97
64	0.91	0.93	0.96	0.98	0.99

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.15	0.75	0.93
512	0.01	0.03	0.17	0.75	0.93
256	0.05	0.08	0.24	0.75	0.93
128	0.46	0.58	0.73	0.89	0.96
64	0.93	0.95	0.96	0.98	0.99

Albedo / Normal	1024	512	256	128	64
1024		0.04	0.22	0.79	0.96
512	0.02	0.05	0.27	0.81	0.96
256	0.07	0.14	0.33	0.81	0.96
128	0.55	0.67	0.78	0.92	0.98
64	0.98	0.98	0.99	1	1

Albedo / Normal	1024	512	256	128	64
1024		0.03	0.21	0.89	0.98
512	0.02	0.03	0.22	0.89	0.98
256	0.04	0.06	0.24	0.89	0.98
128	0.26	0.4	0.62	0.94	0.99
64	0.86	0.9	0.96	0.99	1

Minecart



Albedo / Normal	1024	512	256	128	64
1024		0.16	0.84	0.98	1
512	0.02	0.21	0.85	0.98	1
256	0.12	0.45	0.91	0.98	1
128	0.54	0.82	0.96	0.99	1
64	0.83	0.93	0.98	1	1

Albedo / Normal	1024	512	256	128	64
1024		0.09	0.6	0.87	0.95
512	0.01	0.14	0.65	0.88	0.96
256	0.12	0.37	0.75	0.91	0.96
128	0.51	0.7	0.87	0.95	0.98
64	0.8	0.88	0.95	0.98	0.99

Albedo / Normal	1024	512	256	128	64
1024		0.18	0.85	0.98	1
512	0.01	0.23	0.86	0.98	1
256	0.1	0.5	0.89	0.99	1
128	0.59	0.78	0.96	0.99	1
64	0.87	0.93	0.98	1	1

Albedo / Normal	1024	512	256	128	64
1024		0.09	0.66	0.96	0.99
512	0.01	0.11	0.69	0.97	0.99
256	0.03	0.16	0.75	0.97	0.99
128	0.17	0.39	0.84	0.98	0.99
64	0.66	0.81	0.96	0.99	1

Albedo / Normal	1024	512	256	128	64
1024		0.16	0.84	0.99	1
512	0.02	0.23	0.86	0.99	1
256	0.15	0.55	0.92	0.99	1
128	0.69	0.88	0.98	1	1
64	0.95	0.98	1	1	1

Albedo / Normal	1024	512	256	128	64
1024		0.12	0.79	0.95	0.99
512	0.01	0.17	0.81	0.96	0.99
256	0.13	0.46	0.87	0.96	0.99
128	0.55	0.78	0.95	0.98	1
64	0.82	0.92	0.98	0.99	1

Albedo / Normal	1024	512	256	128	64
1024		0.19	0.85	0.98	1
512	0.02	0.24	0.87	0.99	1
256	0.14	0.51	0.91	0.99	1
128	0.53	0.83	0.97	1	1
64	0.87	0.96	0.99	1	1

Albedo / Normal	1024	512	256	128	64
1024		0.07	0.63	0.93	0.98
512	0.01	0.1	0.67	0.93	0.98
256	0.04	0.2	0.76	0.95	0.99
128	0.22	0.49	0.87	0.97	0.99
64	0.5	0.76	0.93	0.98	1

PillarArch

Albedo / Normal	1024	512	256	128	64
1024		0.06	0.51	0.93	0.98
512	0.01	0.07	0.52	0.93	0.98
256	0.02	0.11	0.56	0.93	0.98
128	0.13	0.27	0.72	0.96	0.99
64	0.36	0.56	0.87	0.98	0.99

Albedo / Normal	1024	512	256	128	64
1024		0.06	0.41	0.95	0.99
512	0	0.07	0.43	0.95	0.99
256	0.01	0.09	0.47	0.95	0.99
128	0.09	0.21	0.59	0.97	0.99
64	0.35	0.51	0.79	0.98	1

Albedo / Normal	1024	512	256	128	64
1024		0.05	0.49	0.96	0.99
512	0	0.06	0.52	0.96	0.99
256	0	0.07	0.53	0.96	0.99
128	0.02	0.11	0.58	0.96	0.99
64	0.05	0.16	0.61	0.96	0.99

Albedo / Normal	1024	512	256	128	64
1024		0.09	0.58	0.98	1
512	0	0.11	0.62	0.98	1
256	0.02	0.14	0.65	0.98	1
128	0.15	0.35	0.84	1	1
64	0.56	0.74	0.95	1	1

Albedo / Normal	1024	512	256	128	64
1024		0.07	0.55	0.97	1
512	0.01	0.08	0.56	0.97	1
256	0.01	0.1	0.59	0.97	1
128	0.04	0.18	0.69	0.98	1
64	0.16	0.34	0.77	0.98	1

Albedo / Normal	1024	512	256	128	64
1024		0.07	0.51	0.95	0.99
512	0	0.08	0.54	0.95	0.99
256	0.04	0.15	0.61	0.96	0.99
128	0.39	0.56	0.85	0.98	1
64	0.76	0.85	0.95	0.99	1

Albedo / Normal	1024	512	256	128	64
1024		0.05	0.37	0.93	0.99
512	0.01	0.07	0.41	0.95	1
256	0.08	0.16	0.58	0.96	1
128	0.67	0.75	0.91	0.99	1
64	0.95	0.97	0.99	1	1

Albedo / Normal	1024	512	256	128	64
1024		0.06	0.55	0.96	0.99
512	0	0.07	0.56	0.97	0.99
256	0.01	0.08	0.56	0.96	0.99
128	0.02	0.11	0.56	0.96	0.99
64	0.09	0.21	0.6	0.97	0.99

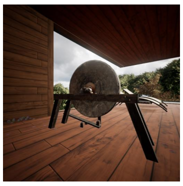
Figure 6: *Examples of 8 views rendered using reference texture (rows) and the corresponding metric predictions for all combinations of normal and albedo texture resolutions. The columns in the tables represent variation in the albedo map resolution, and the rows the variation in the normal map resolution. The color coding represents the probability of detection, from 0 (green, invisible) to 1 (red, definitely visible).*

SharpeningStone

Albedo / Normal	1024	512	256	128	64
1024		0.05	0.25	0.54	0.7
512	0.02	0.05	0.25	0.57	0.69
256	0.03	0.09	0.32	0.59	0.73
128	0.13	0.3	0.47	0.72	0.8
64	0.24	0.37	0.56	0.76	0.82

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.12	0.58	0.89
512	0.01	0.02	0.13	0.59	0.9
256	0.01	0.03	0.15	0.62	0.91
128	0.02	0.04	0.19	0.66	0.92
64	0.04	0.09	0.26	0.73	0.94

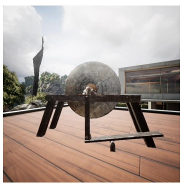
Albedo / Normal	1024	512	256	128	64
1024		0.03	0.19	0.81	0.96
512	0.01	0.03	0.2	0.82	0.96
256	0.01	0.04	0.22	0.82	0.96
128	0.02	0.07	0.28	0.84	0.97
64	0.05	0.13	0.36	0.86	0.97



Albedo / Normal	1024	512	256	128	64
1024		0.01	0.05	0.38	0.72
512	0	0.01	0.05	0.39	0.72
256	0	0.01	0.06	0.4	0.73
128	0	0.02	0.06	0.41	0.74
64	0.01	0.02	0.07	0.42	0.74

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.07	0.25	0.46
512	0.01	0.03	0.07	0.26	0.46
256	0.02	0.05	0.11	0.29	0.49
128	0.11	0.17	0.24	0.46	0.69
64	0.19	0.24	0.33	0.56	0.73

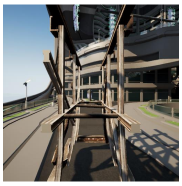
Albedo / Normal	1024	512	256	128	64
1024		0.02	0.12	0.65	0.92
512	0.01	0.03	0.13	0.66	0.92
256	0.01	0.04	0.16	0.68	0.92
128	0.04	0.11	0.23	0.73	0.93
64	0.13	0.21	0.36	0.79	0.95



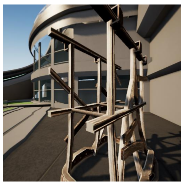
Albedo / Normal	1024	512	256	128	64
1024		0.02	0.12	0.74	0.95
512	0.02	0.03	0.13	0.75	0.95
256	0.02	0.04	0.15	0.77	0.95
128	0.02	0.05	0.18	0.78	0.95
64	0.05	0.09	0.24	0.8	0.95

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.1	0.56	0.87
512	0.02	0.02	0.11	0.57	0.87
256	0.02	0.04	0.14	0.59	0.88
128	0.02	0.06	0.18	0.61	0.88
64	0.05	0.1	0.25	0.67	0.89

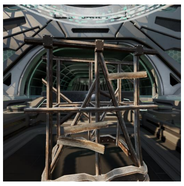
TrackScaffold



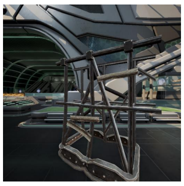
Albedo / Normal	1024	512	256	128	64
1024		0.06	0.51	0.93	0.98
512	0.01	0.07	0.52	0.93	0.98
256	0.02	0.11	0.56	0.93	0.98
128	0.13	0.27	0.72	0.96	0.99
64	0.36	0.56	0.87	0.98	0.99



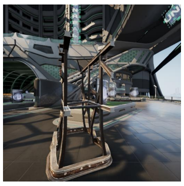
Albedo / Normal	1024	512	256	128	64
1024		0.06	0.41	0.95	0.99
512	0	0.07	0.43	0.95	0.99
256	0.01	0.09	0.47	0.95	0.99
128	0.09	0.21	0.59	0.97	0.99
64	0.35	0.51	0.79	0.98	1



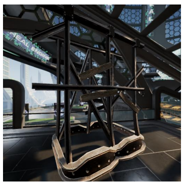
Albedo / Normal	1024	512	256	128	64
1024		0.05	0.49	0.96	0.99
512	0	0.06	0.52	0.96	0.99
256	0	0.07	0.53	0.96	0.99
128	0.02	0.11	0.58	0.96	0.99
64	0.05	0.16	0.61	0.96	0.99



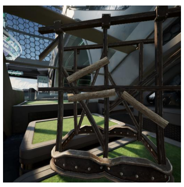
Albedo / Normal	1024	512	256	128	64
1024		0.09	0.58	0.98	1
512	0	0.11	0.62	0.98	1
256	0.02	0.14	0.65	0.98	1
128	0.15	0.35	0.84	1	1
64	0.56	0.74	0.95	1	1



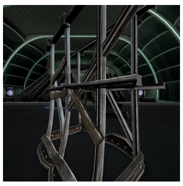
Albedo / Normal	1024	512	256	128	64
1024		0.07	0.55	0.97	1
512	0.01	0.08	0.56	0.97	1
256	0.01	0.1	0.59	0.97	1
128	0.04	0.18	0.69	0.98	1
64	0.16	0.34	0.77	0.98	1



Albedo / Normal	1024	512	256	128	64
1024		0.05	0.37	0.93	0.99
512	0.01	0.07	0.41	0.95	1
256	0.08	0.16	0.58	0.96	1
128	0.67	0.75	0.91	0.99	1
64	0.95	0.97	0.99	1	1



Albedo / Normal	1024	512	256	128	64
1024		0.07	0.51	0.95	0.99
512	0	0.08	0.54	0.95	0.99
256	0.04	0.15	0.61	0.96	0.99
128	0.39	0.56	0.85	0.98	1
64	0.76	0.85	0.95	0.99	1



Albedo / Normal	1024	512	256	128	64
1024		0.06	0.55	0.96	0.99
512	0	0.07	0.56	0.97	0.99
256	0.01	0.08	0.56	0.96	0.99
128	0.02	0.11	0.56	0.96	0.99
64	0.09	0.21	0.6	0.97	0.99

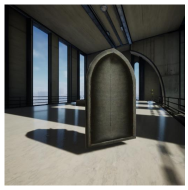
DemonDoor

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.06	0.42	0.84
512	0	0.02	0.06	0.44	0.84
256	0.01	0.02	0.07	0.44	0.84
128	0.02	0.05	0.11	0.48	0.85
64	0.12	0.16	0.27	0.62	0.9

Albedo / Normal	1024	512	256	128	64
1024		0.01	0.05	0.33	0.74
512	0	0.01	0.05	0.37	0.76
256	0.01	0.02	0.07	0.4	0.77
128	0.05	0.09	0.18	0.51	0.82
64	0.49	0.55	0.68	0.84	0.94

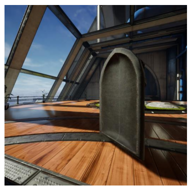
Albedo / Normal	1024	512	256	128	64
1024		0.01	0.04	0.32	0.77
512	0	0.01	0.05	0.34	0.78
256	0	0.02	0.05	0.35	0.78
128	0.02	0.04	0.09	0.4	0.8
64	0.09	0.17	0.27	0.59	0.87

Albedo / Normal	1024	512	256	128	64
1024		0.01	0.01	0.02	0.04
512	0.01	0.01	0.01	0.02	0.04
256	0.01	0.01	0.01	0.02	0.04
128	0.01	0.01	0.01	0.02	0.04
64	0.01	0.02	0.02	0.03	0.05

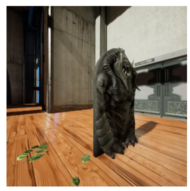


Albedo / Normal	1024	512	256	128	64
1024		0.01	0.05	0.32	0.8
512	0.01	0.01	0.05	0.4	0.82
256	0.02	0.02	0.07	0.45	0.82
128	0.04	0.05	0.08	0.45	0.83
64	0.15	0.22	0.29	0.55	0.86

Albedo / Normal	1024	512	256	128	64
1024		0.02	0.05	0.24	0.51
512	0.01	0.02	0.06	0.25	0.55
256	0.02	0.03	0.08	0.28	0.56
128	0.04	0.07	0.13	0.33	0.62
64	0.14	0.19	0.28	0.45	0.69



Albedo / Normal	1024	512	256	128	64
1024		0.02	0.04	0.32	0.8
512	0.01	0.02	0.04	0.38	0.82
256	0.01	0.02	0.05	0.38	0.82
128	0.02	0.03	0.07	0.39	0.83
64	0.06	0.08	0.15	0.47	0.86



Albedo / Normal	1024	512	256	128	64
1024		0.01	0.04	0.25	0.72
512	0.01	0.01	0.04	0.27	0.73
256	0.01	0.02	0.04	0.29	0.75
128	0.02	0.04	0.09	0.36	0.78
64	0.29	0.35	0.47	0.72	0.9

Figure 7: *Examples of 8 views rendered using reference texture (rows) and the corresponding metric predictions for all combinations of normal and albedo texture resolutions. The columns in the tables represent variation in the albedo map resolution, and the rows the variation in the normal map resolution. The color coding represents the probability of detection, from 0 (green, invisible) to 1 (red, definitely visible).*