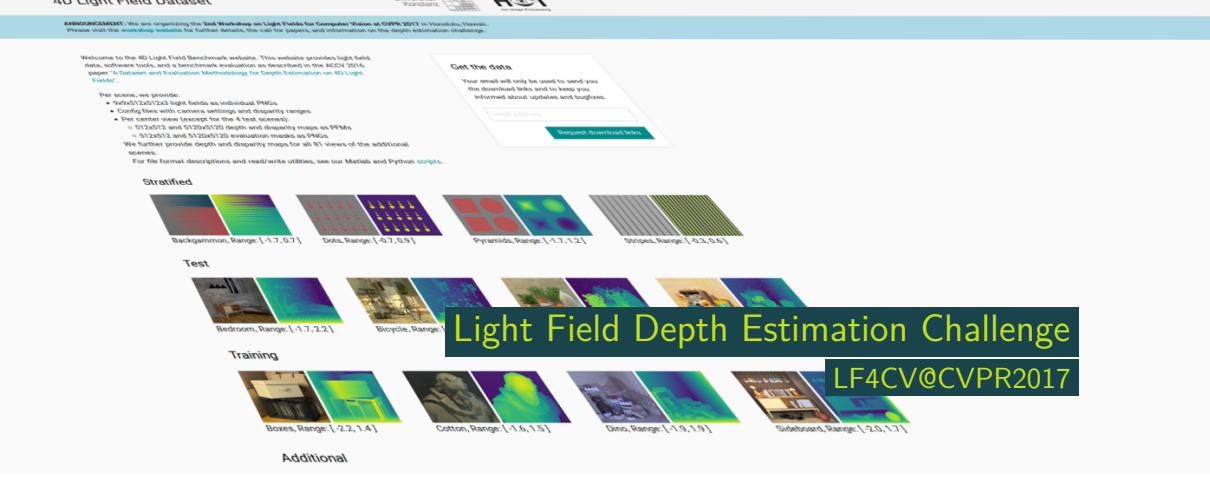


Light Field Depth Estimation Challenge

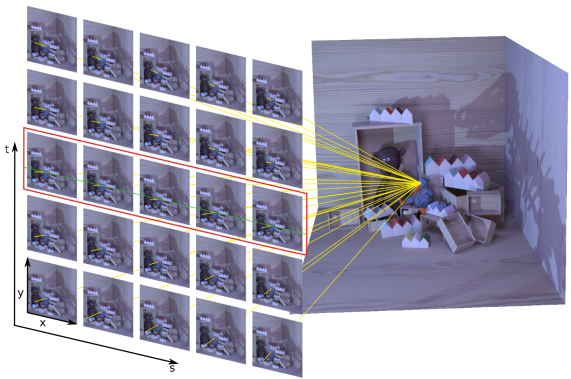
LF4CV@CVPR2017

Katrin Honauer, Ole Johannsen, Bastian Goldluecke

July 26, 2017

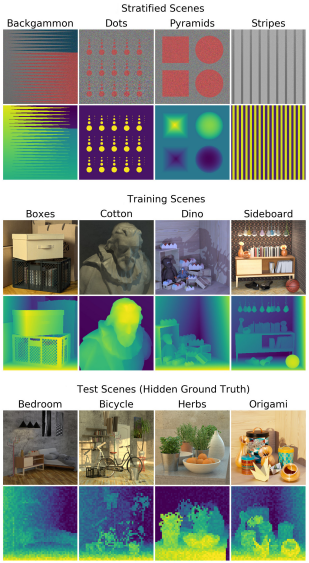
CVIA computer vision and image analysis
Universität Konstanz
SFB-TRR 161
UNIVERSITÄT HEIDELBERG ZUKUNFT SEIT 1386
Heidelberg Collaboratory for Image Processing

4D Light Fields

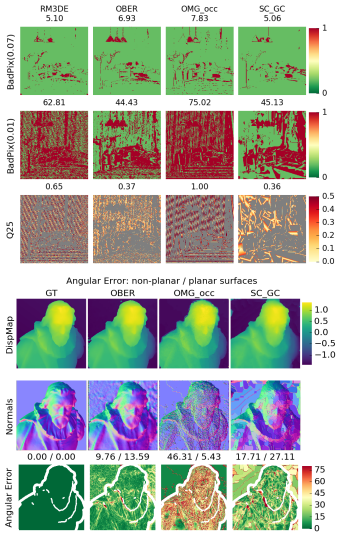


- 2D grid of 2D views
- all cameras are parallel and identical (except shift: negative disparity)

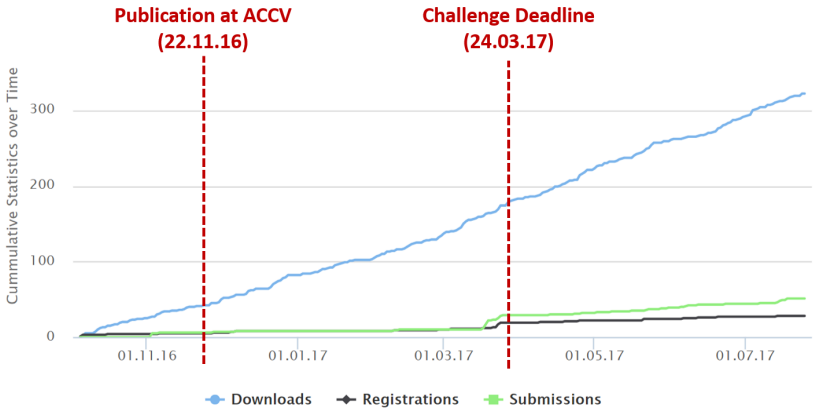
[Figure: Johannsen and Honauer 2017]



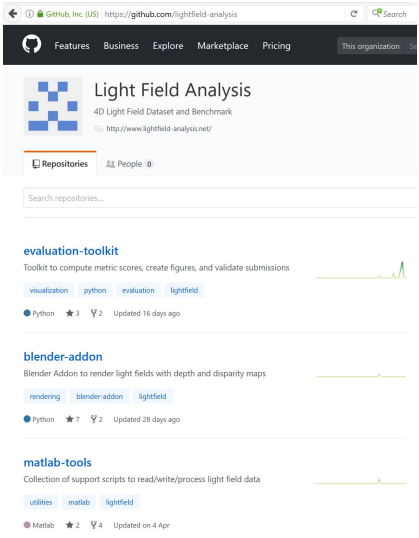
- 12 scenes in 3 categories:
  stratified + photorealistic (test and training)
- 9x9x512x512x3 input images + config files with camera settings and disparity ranges
- ground truth of test scenes is hidden
- 16 additional scenes for algorithm development



- metrics quantify different aspects of disparity map quality
- general: BadPix(0.07), MSE
- per region: discontinuities, fine structures, smoothness of planar/continuous surfaces
- novel: high accuracy, surface normals



28 submissions, 324 downloads, 200 visitors/week (since October 2016)



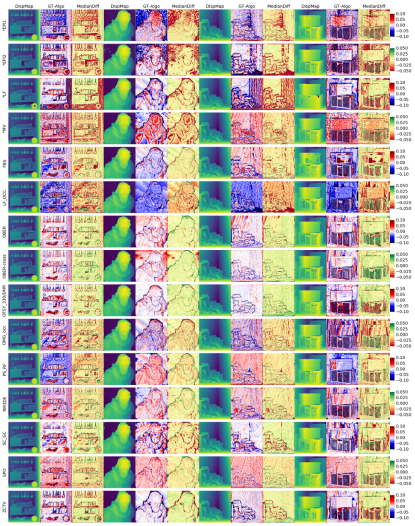
https://github.com/lightfield-analysis

- Blender addon
- Matlab tools
- Python evaluation toolkit
- interactive online visualizations
- access to raw evaluation scores

Planned:

- Blender scenes
- submitted disparity maps
- extended FAQ

Challenge



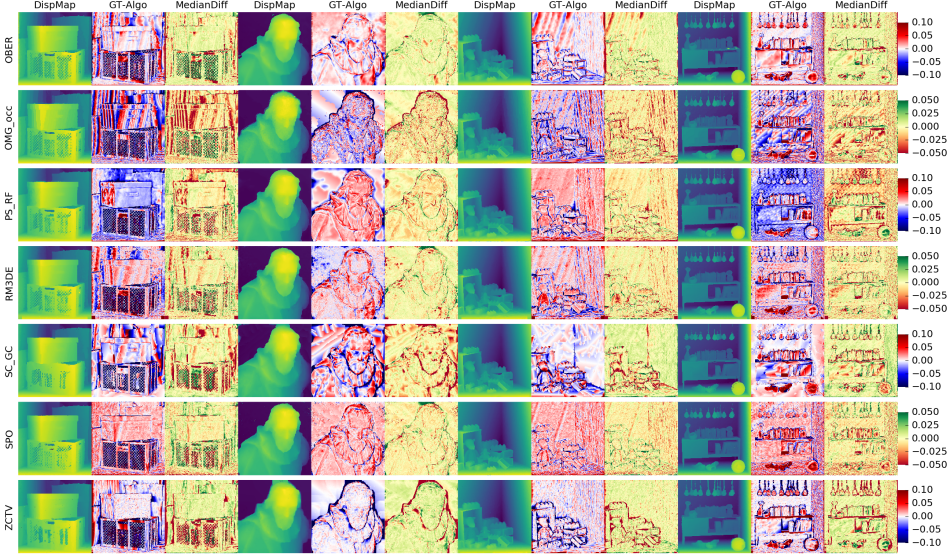
- novel and existing methods
- one set of parameters for all scenes
- submit 512x512 disparity map for each of the 12 scenes + runtimes

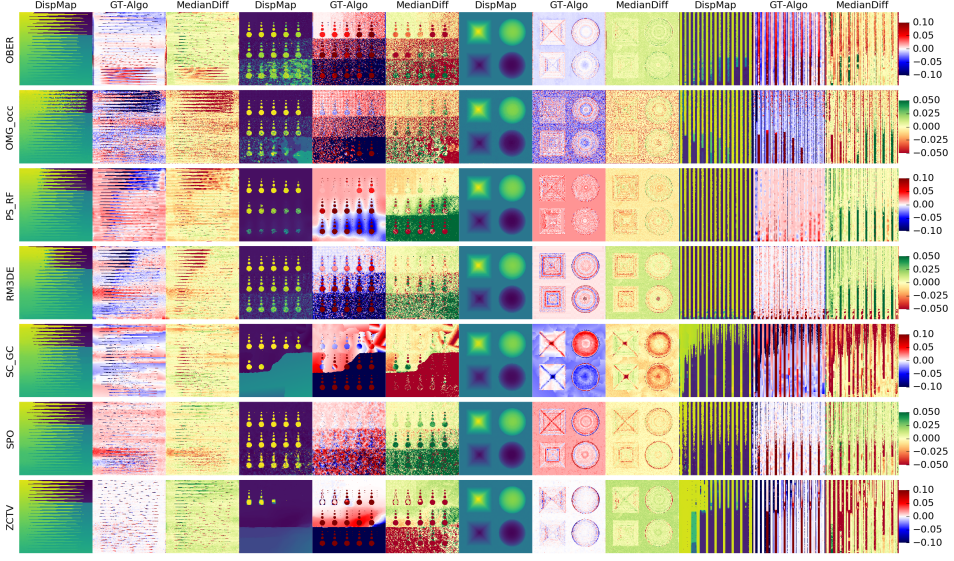
algorithm	dataterm	views	occlusion aware dataterm	interpolation	cost volume	optimization	refinement
*EPI1	EPI	crosshair (5×5)	no	-	50	variational	variational TGV-L^1
*EPI2	EPI	crosshair	no	-	-	-	variational TGV-L^2
*LF	MultiView	full	no	phase shift	100	MRF	iterative refinement
*LF_OCC	SCam	full	yes	linear	200	MRF	occlusion aware MRF
*MV	MultiView	crosshair	yes	linear	100	variational	variational TGV-L^1
'OBER-cross	EPI	crosshair	no	linear	-	-	bilateral refinement
'OFSY_330DNR	Focus	crosshair	yes	linear	330	variational	variational normal regularization
OBER	EPI	horizontal	no	linear	-	-	bilateral refinement
OMG_occ	SCam	full	yes	linear	100	MRF	occlusion aware MRF
PS_RF	MultiView	full	no	phase shift	151	random forest	weighted median
RM3DE	MultiView	crosshair + diagonals	yes	-	-	-	weighted median
SC_GC	SCam	full	yes	linear	256	MRF	second order smoothness in MRF
SPO	EPI	crosshair	no	linear	256	winner takes all	guided filtering (on cost volume)
ZCTV	EPI	horizontal	no	-	-	-	second order TV

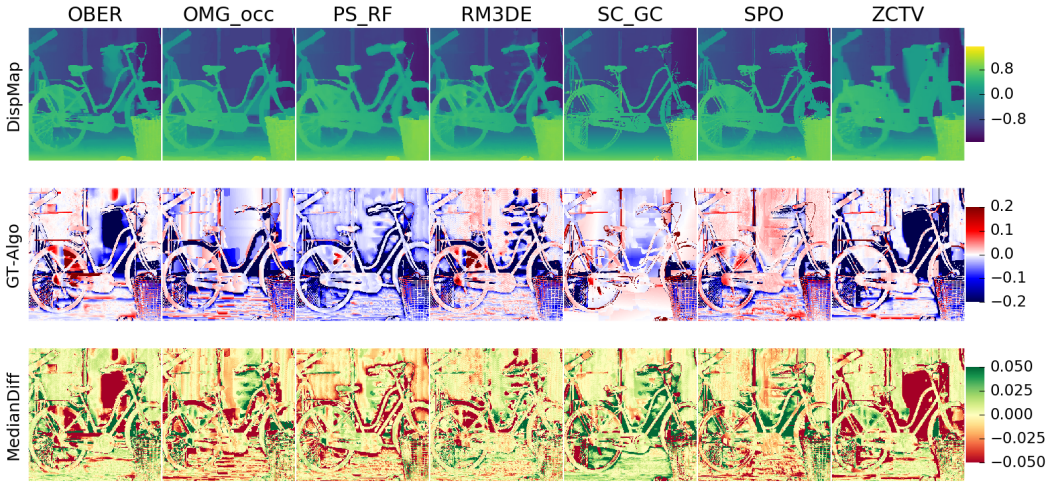
- 7 challenge participants
- Challenge report:

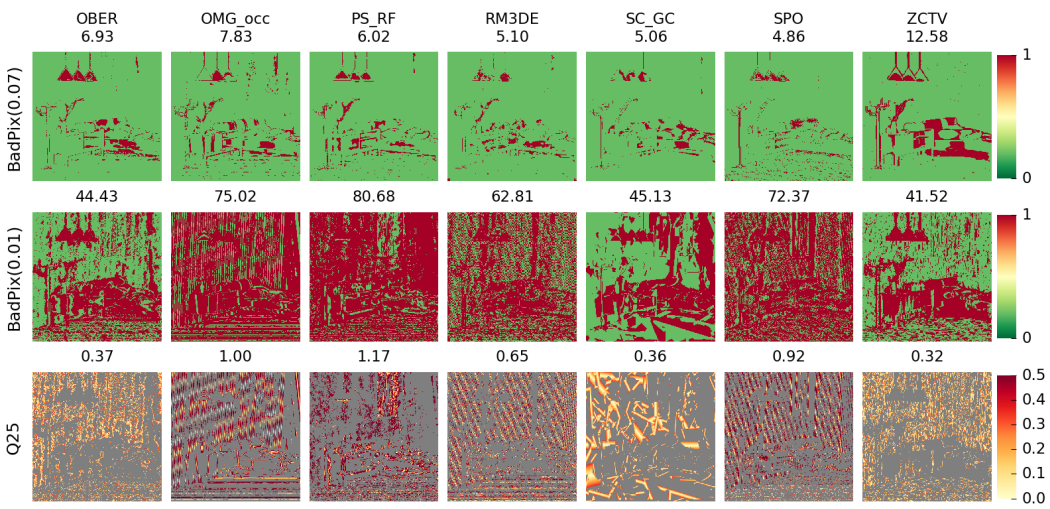
  A Taxonomy and Evaluation of Dense Light Field Depth Estimation Algorithms

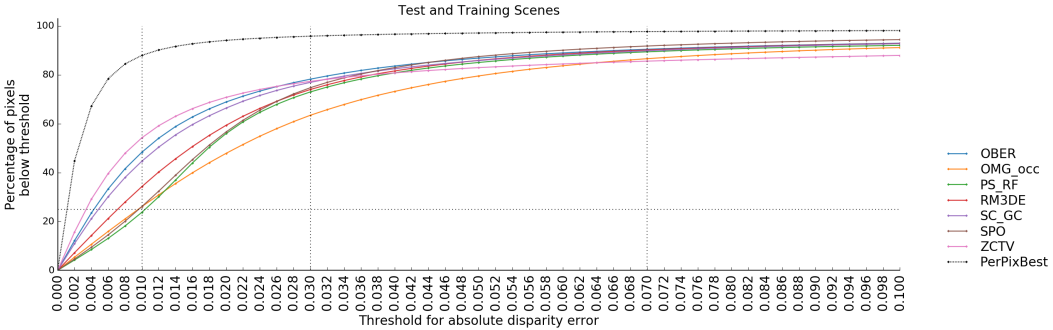
  Ole Johannsen*, Katrin Honauer*, Bastian Goldluecke, Anna Alperovich, Federica Battisti, Yunsu Bok, Michele Brizzi, Marco Carli, Gyeongmin Choe, Maximilian Diebold, Marcel Gutsche, Hae-Gon Jeon, In So Kweon, Jaesik Park, Jinsun Park, Hendrik Schilling, Hao Sheng, Lipeng Si, Michael Strecke, Antonin Sulc, Yu-Wing Tai, Qing Wang, Ting-Chun Wang, Sven Wanner, Zhang Xiong, Jingyi Yu, Shuo Zhang, and Hao Zhu. (*equal contribution)

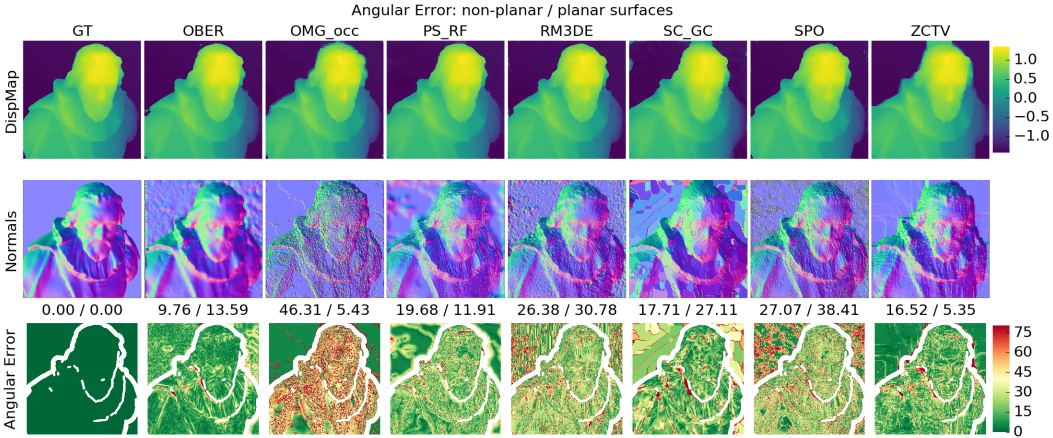

DispMap
GT-Algo
MedianDiff
DispMap
GT-Algo
MedianDiff
DispMap
GT-Algo
MedianDiff
DispMap
GT-Algo
MedianDiff
OBER
OMG_occ
PS_RF
RM3DE
SC_GC
SPO
ZCTV
0.10
0.05
0.00
−0.05
−0.10
0.050
0.025
0.000
−0.025
−0.050


DispMap
GT-Algo
MedianDiff
DispMap
GT-Algo
MedianDiff
DispMap
GT-Algo
MedianDiff
DispMap
GT-Algo
MedianDiff
OBER
OMG_occ
PS_RF
RM3DE
SC_GC
SPO
ZCTV
0.10
0.05
0.00
−0.05
−0.10
0.050
0.025
0.000
−0.025
−0.050


OBER
OMG_occ
PS_RF
RM3DE
SC_GC
SPO
ZCTV
DispMap
0.8
0.0
−0.8
GT-Algo
0.2
0.1
0.0
−0.1
−0.2
MedianDiff
0.050
0.025
0.000
−0.025
−0.050


OBER
6.93
OMG_occ
7.83
PS_RF
6.02
RM3DE
5.10
SC_GC
5.06
SPO
4.86
ZCTV
12.58
BadPix(0.07)
1
0
44.43
75.02
80.68
62.81
45.13
72.37
41.52
BadPix(0.01)
1
0
0.37
1.00
1.17
0.65
0.36
0.92
0.32
Q25
0.5
0.4
0.3
0.2
0.1
0.0

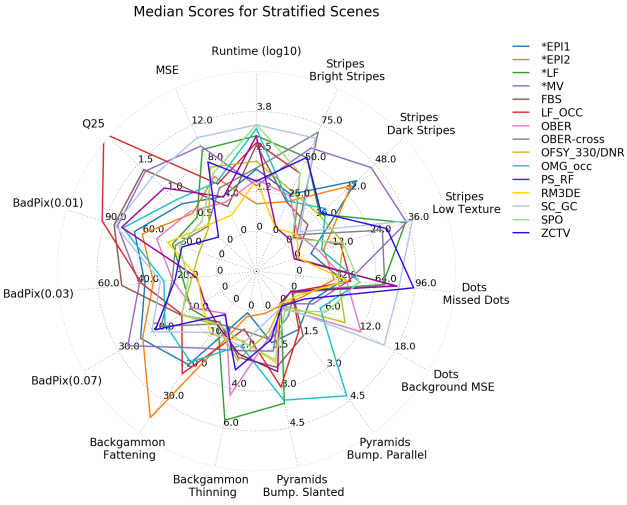

Test and Training Scenes
Percentage of pixels below threshold
Threshold for absolute disparity error
OBER
OMG_occ
PS_RF
RM3DE
SC_GC
SPO
ZCTV
PerPixBest


Angular Error: non-planar / planar surfaces
GT
OBER
OMG_occ
PS_RF
RM3DE
SC_GC
SPO
ZCTV
DispMap
1.0
0.5
0.0
−0.5
−1.0
Normals
0.00 / 0.00
9.76 / 13.59
46.31 / 5.43
19.68 / 11.91
26.38 / 30.78
17.71 / 27.11
27.07 / 38.41
16.52 / 5.35
Angular Error
75
60
45
30
15
0

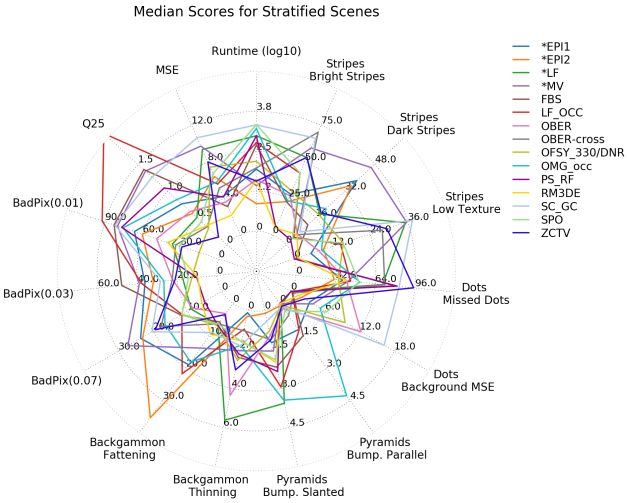


Results

Questions?



and the winner is:



and the winner is: no one... sorry :(

different algorithms, different strengths, no overall best algorithm

OBER

Accuracy Champion

Hendrik Schilling and Maximilian Diebold

PS_RF

Robustness Champion

Hae-Gon Jeon, Jaesik Park, Gyeongmin Choe, Jinsun Park, Yunsu Bok, Yu-Wing Tai, In So Kweon

RM3DE

Jack of all trades

Federica Battisti, Michele Brizzi, Marco Carli, and Alessandro Neri

SPO

Discontinuities Champion

Shuo Zhang, Hao Sheng, and Zhang Xiong



Results
Current Leaderboard

Algorithm	Meta				Stratified								Test								Training							
	MEDIAN ▲ No preview		AVG No preview		Backgammon Preview		Dots Preview		Pyramids Preview		Stripes Preview		Bedroom Preview		Bicycle Preview		Herbs Preview		Origami Preview		Boxes Preview		Cotton Preview		Dino Preview		Sideboard Preview	
OBER-cross+ANP	3.371	1	4.594	1	3.413	2	0.974	1	0.364	8	3.065	2	3.329	2	8.683	1	7.120	1	8.665	1	10.759	1	1.018	2	2.070	3	5.671	1
SPO-MO	3.784	2	5.708	2	3.450	3	2.781	2	0.050	1	4.118	3	3.228	1	10.051	2	8.269	4	9.411	3	15.494	4	2.161	6	1.968	2	7.515	3
OBER-cross	6.715	3	10.289	7	3.504	4	32.534	18	0.301	5	31.717	23	5.234	7	11.797	6	7.146	2	8.936	2	13.129	2	0.939	1	1.952	1	6.284	2
PS_RF	7.559	4	8.578	4	7.142	15	7.975	5	0.107	2	2.964	1	6.015	9	17.173	13	10.480	10	13.573	10	18.946	8	2.425	9	4.379	9	11.752	11
RM3DE	7.992	5	10.216	6	7.510	17	31.735	16	0.682	16	4.132	4	5.099	6	16.083	9	10.144	9	13.556	9	19.258	10	2.023	4	3.892	8	8.475	6
EPN+OS+GC	8.594	6	10.724	8	3.328	1	39.248	20	0.242	3	18.545	15	7.543	12	11.599	5	9.190	6	10.749	6	15.304	3	2.060	5	2.877	5	7.997	4
SPO	8.779	7	8.466	3	3.781	7	16.274	12	0.861	19	14.987	10	4.864	4	10.907	4	8.260	3	11.698	7	15.889	5	2.594	10	2.184	4	9.297	7
OBER	9.021	8	11.677	11	3.989	9	46.663	26	0.245	4	12.914	7	6.926	10	17.124	12	9.991	8	13.124	8	16.378	6	1.770	3	2.944	6	8.052	5
RPRF	9.892	9	10.020	5	3.737	6	11.014	7	0.875	20	17.248	11	8.769	18	12.198	7	8.673	5	13.904	14	23.794	19	2.803	11	5.375	10	11.845	12
SC_GC	10.206	10	14.299	18	4.891	13	48.513	27	1.233	22	35.707	25	5.060	5	12.207	8	12.688	12	10.672	5	18.568	7	6.281	22	6.025	11	9.741	8
GLFCV	10.759	11	12.196	13	7.497	16	17.671	14	0.585	14	26.459	22	9.163	19	18.150	16	13.370	13	10.019	4	19.929	12	5.423	18	6.583	17	11.499	10
RPRF-5view	10.950	12	12.797	16	3.626	5	11.014	7	0.449	10	18.950	17	10.653	20	10.886	3	9.629	7	18.954	21	33.956	28	3.567	13	18.646	25	13.234	16
OFSY_330/DNR	11.329	13	12.036	12	4.828	12	37.670	19	0.356	7	18.640	16	4.743	3	16.134	10	12.304	11	13.683	12	19.246	9	3.036	12	3.434	7	10.355	9
EpiNet-star+MF	12.349	14	10.929	9	12.603	20	12.799	10	0.455	11	9.465	5	7.405	11	17.312	14	15.511	18	14.386	16	20.546	15	2.176	7	6.398	15	12.094	14
EpiNet-star	12.735	15	11.670	10	12.936	21	17.584	13	0.319	6	12.534	6	7.548	13	18.136	15	15.821	19	14.878	17	19.335	11	2.357	8	6.291	14	12.300	15
BSL_I	13.333	16	12.226	14	4.734	11	26.557	15	0.431	9	13.039	8	8.441	16	19.330	18	14.431	16	13.627	11	20.324	13	4.804	15	6.241	12	14.749	20
FBS*	13.380	17	13.291	17	10.307	19	12.839	11	0.549	13	19.117	18	5.773	8	19.660	21	14.754	17	22.864	24	27.151	25	5.008	17	7.554	20	13.921	18
BSL	13.409	18	12.743	15	4.650	10	32.407	17	0.480	12	13.094	9	8.496	17	19.410	19	14.237	14	13.724	13	20.418	14	4.850	16	6.541	16	14.603	19
OMG_occ	14.605	19	15.403	20	14.952	23	43.263	23	1.441	23	18.026	12	7.832	14	16.724	11	14.259	15	18.894	20	24.664	21	6.212	20	6.648	18	11.919	13
ZCTV	15.151	20	16.323	22	3.981	8	41.497	21	0.610	15	34.582	24	12.582	22	21.123	23	16.568	20	16.388	18	21.042	16	6.312	23	7.272	19	13.914	17
*LF	16.146	21	16.193	21	5.516	14	2.900	3	12.354	28	35.741	26	13.855	26	19.791	22	18.108	22	14.183	15	23.019	18	7.829	24	19.026	26	21.989	27
*MV	17.736	22	18.405	24	8.924	18	45.587	24	0.776	17	46.192	28	8.161	15	19.520	20	18.172	23	19.057	22	21.643	17	9.245	26	6.287	13	17.300	21
LF_OCC	17.816	23	15.074	19	13.522	22	9.695	6	1.450	24	18.334	13	18.344	28	18.995	17	17.722	21	18.779	19	26.030	23	4.743	14	15.366	23	17.910	22
*LF_OCC	18.451	24	17.579	23	19.006	25	5.822	4	3.172	26	18.408	14	17.565	27	21.562	24	36.830	26	22.431	23	26.520	24	6.218	21	14.913	22	18.495	24
MVCMv0	21.952	25	21.060	25	15.199	24	12.047	9	8.515	27	26.316	21	12.920	23	22.821	25	51.137	28	25.630	25	25.555	22	8.677	25	22.305	27	21.599	26
*EPI1	22.891	26	24.324	27	21.331	26	62.001	28	0.858	18	25.809	20	13.588	25	25.213	26	47.082	27	28.901	27	24.451	20	13.928	27	10.350	21	18.376	23
*EPI2	22.942	27	22.651	26	22.076	27	46.534	25	1.083	21	23.808	19	13.557	24	25.585	27	30.944	24	27.121	26	29.795	26	16.694	28	15.667	24	18.953	25
EpiNet-cross-fast	31.138	28	26.911	28	31.989	28	42.903	22	1.941	25	45.076	27	12.472	21	30.287	28	35.075	25	33.161	28	33.282	27	6.063	19	22.364	28	28.316	28



Results
Current Leaderboard

Algorithm	Meta				Stratified						Test						Training							
	MEDIAN ▲ No preview		AVG No preview		Backgammon Preview		Dots Preview		Pyramids Preview		Stripes Preview		Bedroom Preview		Bicycle Preview		Herbs Preview		Origami Preview		Boxes Preview		Cotton Preview		Dino Preview		Sideboard Preview	
OBER-cross+ANP	3.371	1	4.594	1	3.413	2	0.974	1	0.364	8	3.065	2	3.329	2	8.683	1	7.120	1	8.665	1	10.759	1	1.018	2	2.070	3	5.671	1
SPO-MO	3.784	2	5.708	2	3.450	3	2.781	2	0.050	1	4.118	3	3.228	1	10.051	2	8.269	4	9.411	3	15.494	4	2.161	6	1.968	2	7.515	3
OBER-cross	6.715	3	10.289	7	3.504	4	32.534	18	0.301	5	31.717	23	5.234	7	11.797	6	7.146	2	8.936	2	13.129	2	0.939	1	1.952	1	6.284	2
PS_RF	7.559	4	8.578	4	7.142	15	7.975	5	0.107	2	2.964	1	6.015	9	17.173	13	10.480	10	13.573	10	18.946	8	2.425	9	4.379	9	11.752	11
RM3DE	7.992	5	10.216	6	7.510	17	31.735	16	0.682	16	4.132	4	5.099	6	16.083	9	10.144	9	13.556	9	19.258	10	2.023	4	3.892	8	8.475	6
EPN+OS+GC	8.594	6	10.724	8	3.328	1	39.248	20	0.242	3	18.545	15	7.543	12	11.599	5	9.190	6	10.749	6	15.304	3	2.060	5	2.877	5	7.997	4
SPO	8.779	7	8.466	3	3.781	7	16.274	12	0.861	19	14.987	10	4.864	4	10.907	4	8.260	3	11.698	7	15.889	5	2.594	10	2.184	4	9.297	7
OBER	9.021	8	11.677	11	3.989	9	46.663	26	0.245	4	12.914	7	6.926	10	17.124	12	9.991	8	13.124	8	16.378	6	1.770	3	2.944	6	8.052	5
RPRF	9.892	9	10.020	5	3.737	6	11.014	7	0.875	20	17.248	11	8.769	18	12.198	7	8.673	5	13.904	14	23.794	19	2.803	11	5.375	10	11.845	12
SC_GC	10.206	10	14.299	18	4.891	13	48.513	27	1.233	22	35.707	25	5.060	5	12.207	8	12.688	12	10.672	5	18.568	7	6.281	22	6.025	11	9.741	8
GLFCV	10.759	11	12.196	13	7.497	16	17.671	14	0.585	14	26.459	22	9.163	19	18.150	16	13.370	13	10.019	4	19.929	12	5.423	18	6.583	17	11.499	10
RPRF-5view	10.950	12	12.797	16	3.626	5	11.014	7	0.449	10	18.950	17	10.653	20	10.886	3	9.629	7	18.954	21	33.956	28	3.567	13	18.646	25	13.234	16
OFSY_330/DNR	11.329	13	12.036	12	4.828	12	37.670	19	0.356	7	18.640	16	4.743	3	16.134	10	12.304	11	13.683	12	19.246	9	3.036	12	3.434	7	10.355	9
EpiNet-star+MF	12.349	14	10.929	9	12.603	20	12.799	10	0.455	11	9.465	5	7.405	11	17.312	14	15.511	18	14.386	16	20.546	15	2.176	7	6.398	15	12.094	14
EpiNet-star	12.735	15	11.670	10	12.936	21	17.584	13	0.319	6	12.534	6	7.548	13	18.136	15	15.821	19	14.878	17	19.335	11	2.357	8	6.291	14	12.300	15
BSL_I	13.333	16	12.226	14	4.734	11	26.557	15	0.431	9	13.039	8	8.441	16	19.330	18	14.431	16	13.627	11	20.324	13	4.804	15	6.241	12	14.749	20
FBS*	13.380	17	13.291	17	10.307	19	12.839	11	0.549	13	19.117	18	5.773	8	19.660	21	14.754	17	22.864	24	27.151	25	5.008	17	7.554	20	13.921	18
BSL	13.409	18	12.743	15	4.650	10	32.407	17	0.480	12	13.094	9	8.496	17	19.410	19	14.237	14	13.724	13	20.418	14	4.850	16	6.541	16	14.603	19
OMG_occ	14.605	19	15.403	20	14.952	23	43.263	23	1.441	23	18.026	12	7.832	14	16.724	11	14.259	15	18.894	20	24.664	21	6.212	20	6.648	18	11.919	13
ZCTV	15.151	20	16.323	22	3.981	8	41.497	21	0.610	15	34.582	24	12.582	22	21.123	23	16.568	20	16.388	18	21.042	16	6.312	23	7.272	19	13.914	17
*LF	16.146	21	16.193	21	5.516	14	2.900	3	12.354	28	35.741	26	13.855	26	19.791	22	18.108	22	14.183	15	23.019	18	7.829	24	19.026	26	21.989	27
*MV	17.736	22	18.405	24	8.924	18	45.587	24	0.776	17	46.192	28	8.161	15	19.520	20	18.172	23	19.057	22	21.643	17	9.245	26	6.287	13	17.300	21
LF_OCC	17.816	23	15.074	19	13.522	22	9.695	6	1.450	24	18.334	13	18.344	28	18.995	17	17.722	21	18.779	19	26.030	23	4.743	14	15.366	23	17.910	22
*LF_OCC	18.451	24	17.579	23	19.006	25	5.822	4	3.172	26	18.408	14	17.565	27	21.562	24	36.830	26	22.431	23	26.520	24	6.218	21	14.913	22	18.495	24
MVCMv0	21.952	25	21.060	25	15.199	24	12.047	9	8.515	27	26.316	21	12.920	23	22.821	25	51.137	28	25.630	25	25.555	22	8.677	25	22.305	27	21.599	26
*EPI1	22.891	26	24.324	27	21.331	26	62.001	28	0.858	18	25.809	20	13.588	25	25.213	26	47.082	27	28.901	27	24.451	20	13.928	27	10.350	21	18.376	23
*EPI2	22.942	27	22.651	26	22.076	27	46.534	25	1.083	21	23.808	19	13.557	24	25.585	27	30.944	24	27.121	26	29.795	26	16.694	28	15.667	24	18.953	25
EpiNet-cross-fast	31.138	28	26.911	28	31.989	28	42.903	22	1.941	25	45.076	27	12.472	21	30.287	28	35.075	25	33.161	28	33.282	27	6.063	19	22.364	28	28.316	28



Results
Current Leaderboard

Algorithm	Meta				Stratified						Test						Training							
	MEDIAN ▲ No preview		AVG No preview		Backgammon Preview		Dots Preview		Pyramids Preview		Stripes Preview		Bedroom Preview		Bicycle Preview		Herbs Preview		Origami Preview		Boxes Preview		Cotton Preview		Dino Preview		Sideboard Preview	
OBER-cross+ANP	3.371	1	4.594	1	3.413	2	0.974	1	0.364	8	3.065	2	3.329	2	8.683	1	7.120	1	8.665	1	10.759	1	1.018	2	2.070	3	5.671	1
SPO-MO	3.784	2	5.708	2	3.450	3	2.781	2	0.050	1	4.118	3	3.228	1	10.051	2	8.269	4	9.411	3	15.494	4	2.161	6	1.968	2	7.515	3
OBER-cross	6.715	3	10.289	7	3.504	4	32.534	18	0.301	5	31.717	23	5.234	7	11.797	6	7.146	2	8.936	2	13.129	2	0.939	1	1.952	1	6.284	2
PS_RF	7.559	4	8.578	4	7.142	15	7.975	5	0.107	2	2.964	1	6.015	9	17.173	13	10.480	10	13.573	10	18.946	8	2.425	9	4.379	9	11.752	11
RM3DE	7.992	5	10.216	6	7.510	17	31.735	16	0.682	16	4.132	4	5.099	6	16.083	9	10.144	9	13.556	9	19.258	10	2.023	4	3.892	8	8.475	6
EPN+OS+GC	8.594	6	10.724	8	3.328	1	39.248	20	0.242	3	18.545	15	7.543	12	11.599	5	9.190	6	10.749	6	15.304	3	2.060	5	2.877	5	7.997	4
SPO	8.779	7	8.466	3	3.781	7	16.274	12	0.861	19	14.987	10	4.864	4	10.907	4	8.260	3	11.698	7	15.889	5	2.594	10	2.184	4	9.297	7
OBER	9.021	8	11.677	11	3.989	9	46.663	26	0.245	4	12.914	7	6.926	10	17.124	12	9.991	8	13.124	8	16.378	6	1.770	3	2.944	6	8.052	5
RPRF	9.892	9	10.020	5	3.737	6	11.014	7	0.875	20	17.248	11	8.769	18	12.198	7	8.673	5	13.904	14	23.794	19	2.803	11	5.375	10	11.845	12
SC_GC	10.206	10	14.299	18	4.891	13	48.513	27	1.233	22	35.707	25	5.060	5	12.207	8	12.688	12	10.672	5	18.568	7	6.281	22	6.025	11	9.741	8
GLFCV	10.759	11	12.196	13	7.497	16	17.671	14	0.585	14	26.459	22	9.163	19	18.150	16	13.370	13	10.019	4	19.929	12	5.423	18	6.583	17	11.499	10
RPRF-5view	10.950	12	12.797	16	3.626	5	11.014	7	0.449	10	18.950	17	10.653	20	10.886	3	9.629	7	18.954	21	33.956	28	3.567	13	18.646	25	13.234	16
OFSY_330/DNR	11.329	13	12.036	12	4.828	12	37.670	19	0.356	7	18.640	16	4.743	3	16.134	10	12.304	11	13.683	12	19.246	9	3.036	12	3.434	7	10.355	9
EpiNet-star+MF	12.349	14	10.929	9	12.603	20	12.799	10	0.455	11	9.465	5	7.405	11	17.312	14	15.511	18	14.386	16	20.546	15	2.176	7	6.398	15	12.094	14
EpiNet-star	12.735	15	11.670	10	12.936	21	17.584	13	0.319	6	12.534	6	7.548	13	18.136	15	15.821	19	14.878	17	19.335	11	2.357	8	6.291	14	12.300	15
BSL_I	13.333	16	12.226	14	4.734	11	26.557	15	0.431	9	13.039	8	8.441	16	19.330	18	14.431	16	13.627	11	20.324	13	4.804	15	6.241	12	14.749	20
FBS*	13.380	17	13.291	17	10.307	19	12.839	11	0.549	13	19.117	18	5.773	8	19.660	21	14.754	17	22.864	24	27.151	25	5.008	17	7.554	20	13.921	18
BSL	13.409	18	12.743	15	4.650	10	32.407	17	0.480	12	13.094	9	8.496	17	19.410	19	14.237	14	13.724	13	20.418	14	4.850	16	6.541	16	14.603	19
OMG_occ	14.605	19	15.403	20	14.952	23	43.263	23	1.441	23	18.026	12	7.832	14	16.724	11	14.259	15	18.894	20	24.664	21	6.212	20	6.648	18	11.919	13
ZCTV	15.151	20	16.323	22	3.981	8	41.497	21	0.610	15	34.582	24	12.582	22	21.123	23	16.568	20	16.388	18	21.042	16	6.312	23	7.272	19	13.914	17
*LF	16.146	21	16.193	21	5.516	14	2.900	3	12.354	28	35.741	26	13.855	26	19.791	22	18.108	22	14.183	15	23.019	18	7.829	24	19.026	26	21.989	27
*MV	17.736	22	18.405	24	8.924	18	45.587	24	0.776	17	46.192	28	8.161	15	19.520	20	18.172	23	19.057	22	21.643	17	9.245	26	6.287	13	17.300	21
LF_OCC	17.816	23	15.074	19	13.522	22	9.695	6	1.450	24	18.334	13	18.344	28	18.995	17	17.722	21	18.779	19	26.030	23	4.743	14	15.366	23	17.910	22
*LF_OCC	18.451	24	17.579	23	19.006	25	5.822	4	3.172	26	18.408	14	17.565	27	21.562	24	36.830	26	22.431	23	26.520	24	6.218	21	14.913	22	18.495	24
MVCMv0	21.952	25	21.060	25	15.199	24	12.047	9	8.515	27	26.316	21	12.920	23	22.821	25	51.137	28	25.630	25	25.555	22	8.677	25	22.305	27	21.599	26
*EPI1	22.891	26	24.324	27	21.331	26	62.001	28	0.858	18	25.809	20	13.588	25	25.213	26	47.082	27	28.901	27	24.451	20	13.928	27	10.350	21	18.376	23
*EPI2	22.942	27	22.651	26	22.076	27	46.534	25	1.083	21	23.808	19	13.557	24	25.585	27	30.944	24	27.121	26	29.795	26	16.694	28	15.667	24	18.953	25
EpiNet-cross-fast	31.138	28	26.911	28	31.989	28	42.903	22	1.941	25	45.076	27	12.472	21	30.287	28	35.075	25	33.161	28	33.282	27	6.063	19	22.364	28	28.316	28