Semantic Boundary Refinement by Joint Inference from Edges and Regions #supplementary material#

1 Results on Pascal VOC

1.1 Effect of Dilation/Erosion Radius

We show the effect of different combinations of dilation and erosion radius applied on the semantic segmentation to generate initial masks for MCG boundary filtering.

(1,-1)	(1,2)	(1,5)	(3,-1)	(3,2)	(3,5)	(5,-1)	(5,2)	(5,5)
0.47945	0.41315	0.45275	0.4981	0.4441	0.4604	**0.5019**	0.44355	0.46015
(7,-1)	(7,2)	(7,5)	(9,-1)	(9,2)	(9,5)	(11,-1)	(11,2)	(11,5)
0.50185	0.43975	0.4575	0.49935	0.434	0.45215	0.4932	0.42515	0.4444

Table 1: (dilation, erosion) in pixels and the corresponding mean accuracy of boundary detection evaluated on the SBD tuning set. "-1" meaning no erosion is performed. It can be seen using the mask created by dilating 5 pixels with no erosion of the initial segmentation yields the best accuracy.

1.2 Boundary Results Per Class

We show the boundary results per class in Table 2. Figure 1 shows relation between segmentation accuracy and boundary accuracy.

Class	SO	MB	LPC	Fusion	SA	MF
Aeroplane	0.667	0.631	0.240	0.746	0.844	0.755
Bicycle	0.287	0.303	0.207	0.320	0.545	0.460
Bird	0.604	0.558	0.471	0.665	0.815	0.713
Boat	0.399	0.412	0.437	0.446	0.636	0.558
Bottle	0.402	0.381	0.193	0.452	0.659	0.545
Bus	0.577	0.592	0.446	0.692	0.851	0.682
Car	0.483	0.499	0.324	0.546	0.791	0.586
Cat	0.579	0.608	0.350	0.652	0.834	0.695
Chair	0.213	0.188	0.157	0.205	0.307	0.376
Cow	0.565	0.594	0.208	0.639	0.741	0.681
Dining Table	0.192	0.178	0.102	0.178	0.598	0.334
Dog	0.585	0.558	0.339	0.617	0.790	0.676
Horse	0.587	0.596	0.393	0.667	0.761	0.725
Motorbike	0.519	0.552	0.320	0.589	0.832	0.631
Person	0.572	0.628	0.436	0.673	0.808	0.687
Potted Plant	0.283	0.291	0.103	0.359	0.597	0.547
Sheep	0.580	0.605	0.123	0.638	0.822	0.687
Sofa	0.223	0.216	0.157	0.281	0.504	0.441
Train	0.461	0.460	0.220	0.536	0.731	0.623
TV Monitor	0.374	0.356	0.151	0.451	0.637	0.549
mean	45.8	46	26.9	51.8		

Table 2: Average precision of different methods per class, with the semantic segmentation accuracy using DeepLab and maximal F-measure (MF) shown. SO: Segmentation Only; MB: Mask Boundary; LOC: Local Patch Classifier; SA: Segmentation Accuracy.

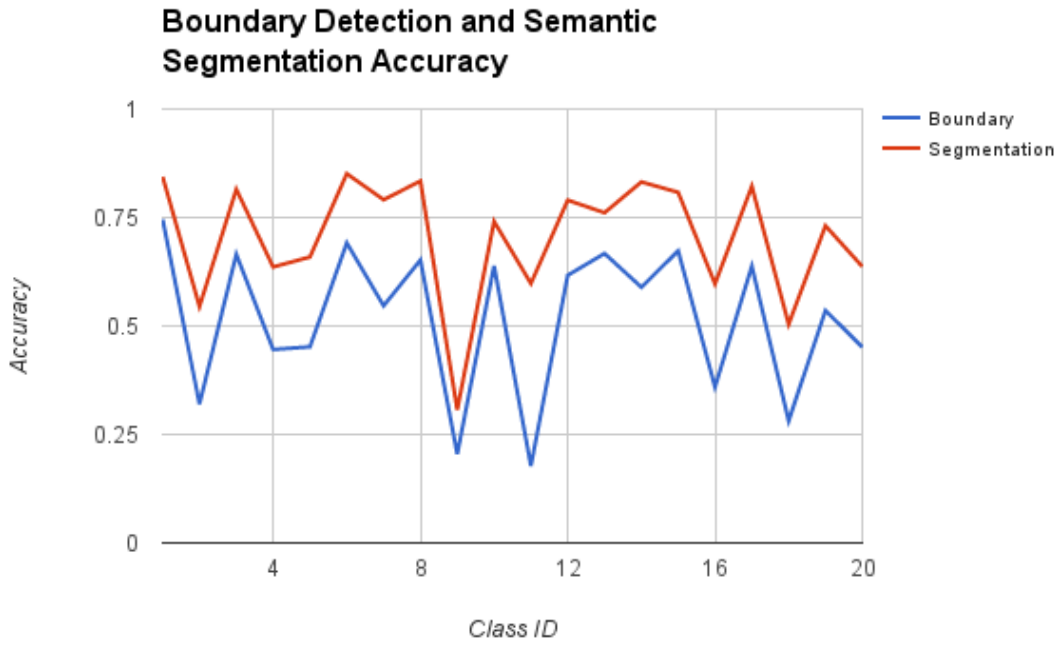
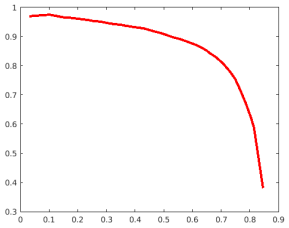


Figure 1: Accuracy of (fused) boundary detection and semantic segmentation per class. Although the measure is different, we can see that the two scores are strongly correlated, and the boundary detection accuracy of our method depends on the segmentation accuracy.

1.3 Precision Recall Curves for Each Class in Pascal VOC

Figure 1.3 shows the precision recall curves of each class in Pascal.



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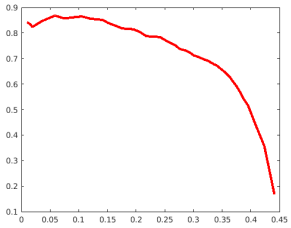
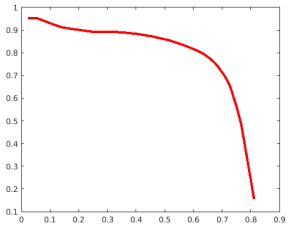
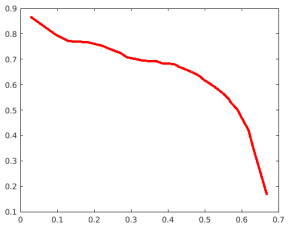


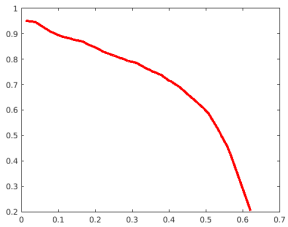
bicycle



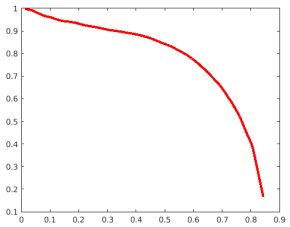
bird



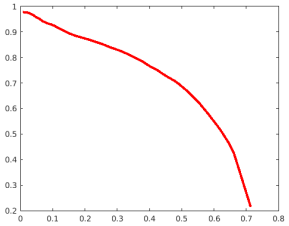
boat



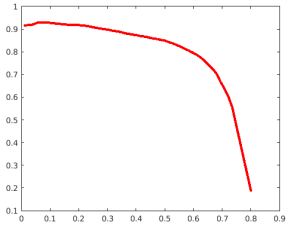
bottle



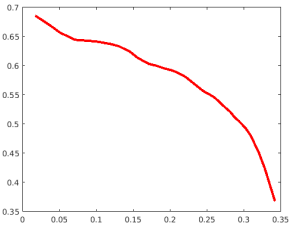
bus



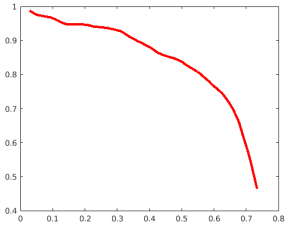
car



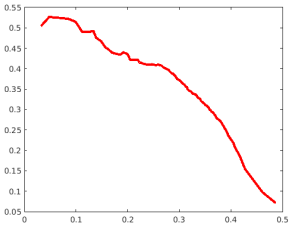
cat



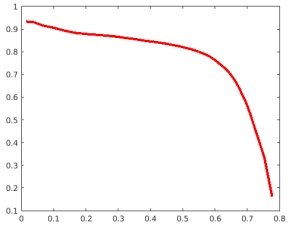
chair



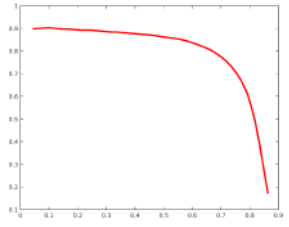
cow



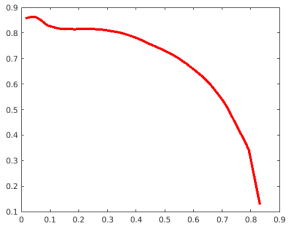
dining table



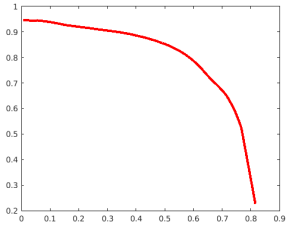
dog



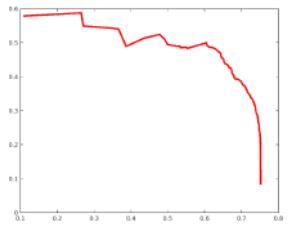
horse



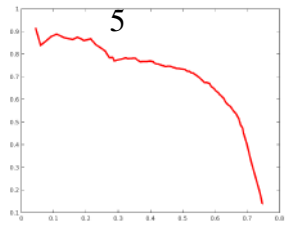
motorbike



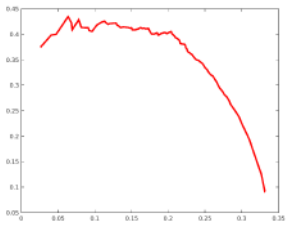
person



potted plant

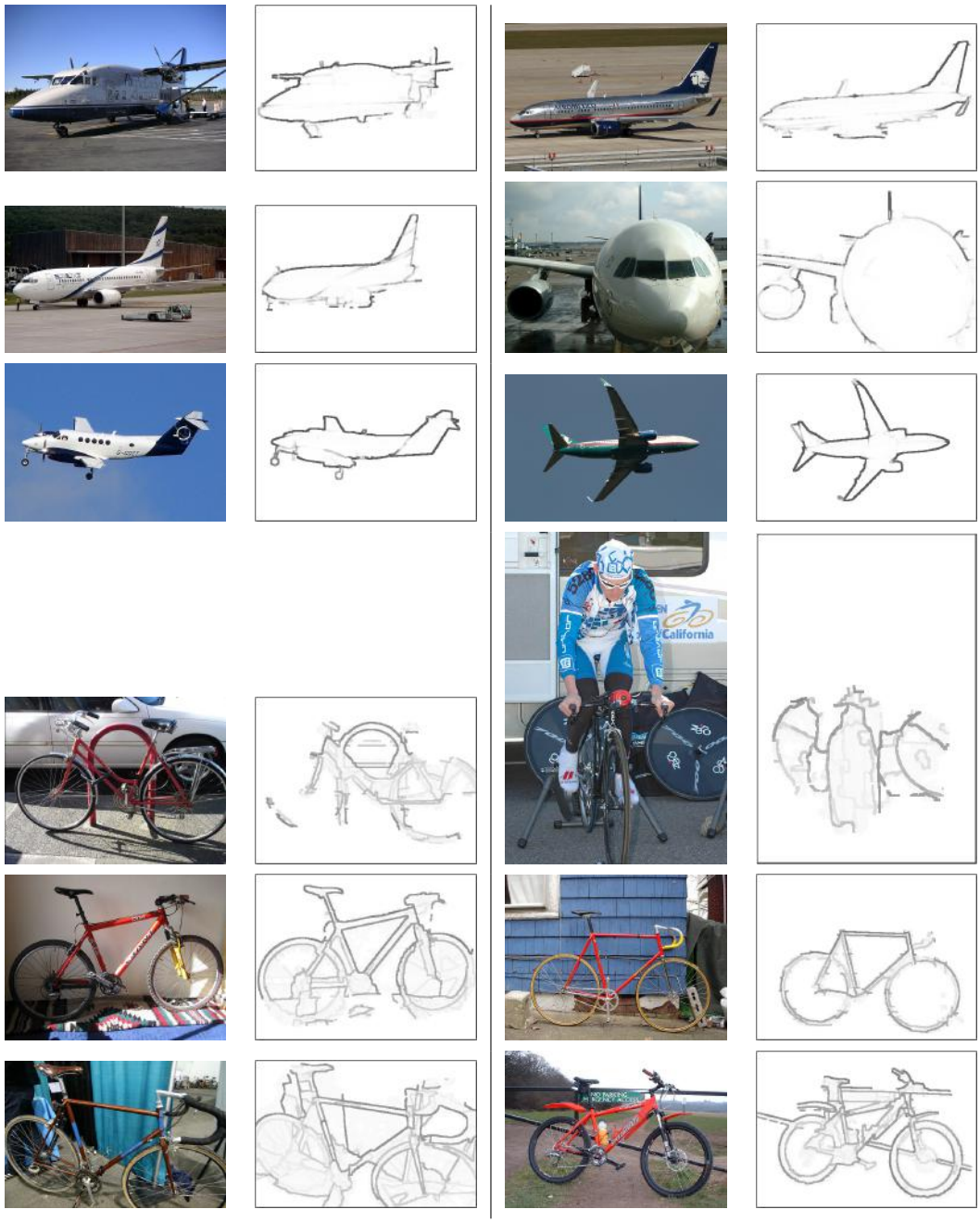


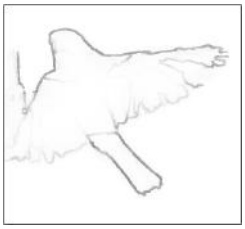
sheep

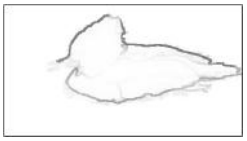


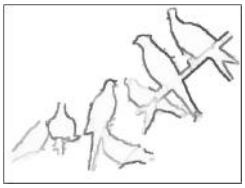
sofa

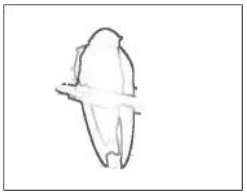
1.4 examples

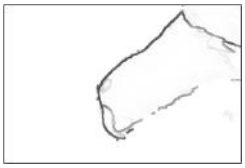




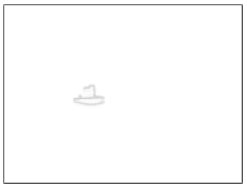


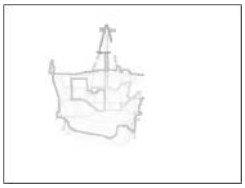


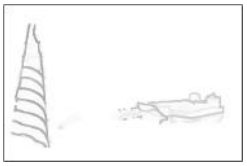


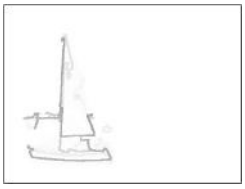


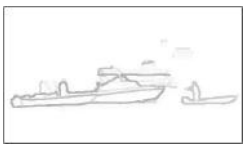


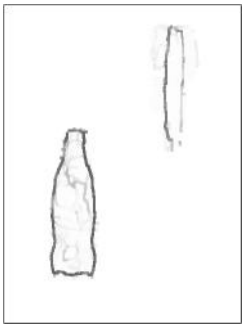


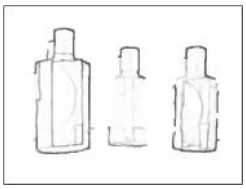


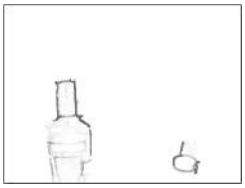


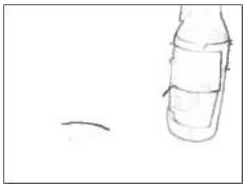


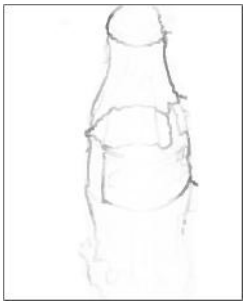


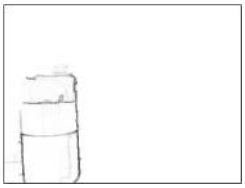



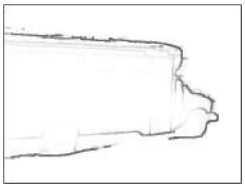


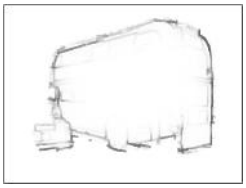


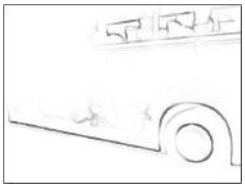


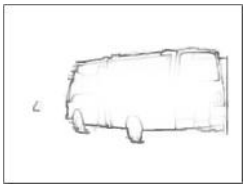
Coca-Cola


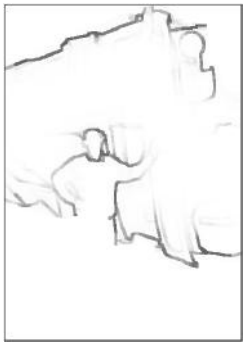


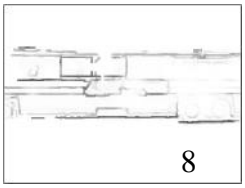


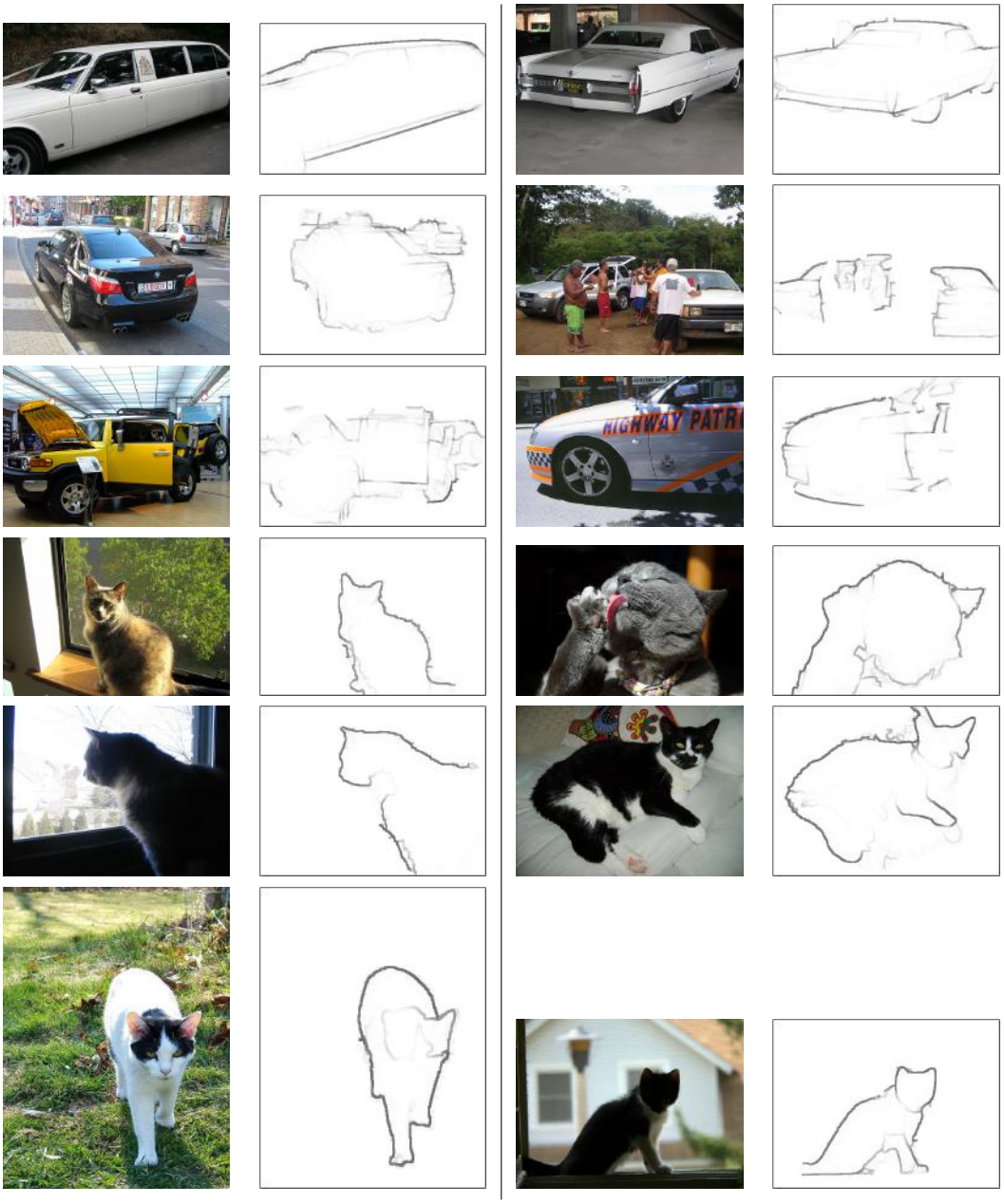


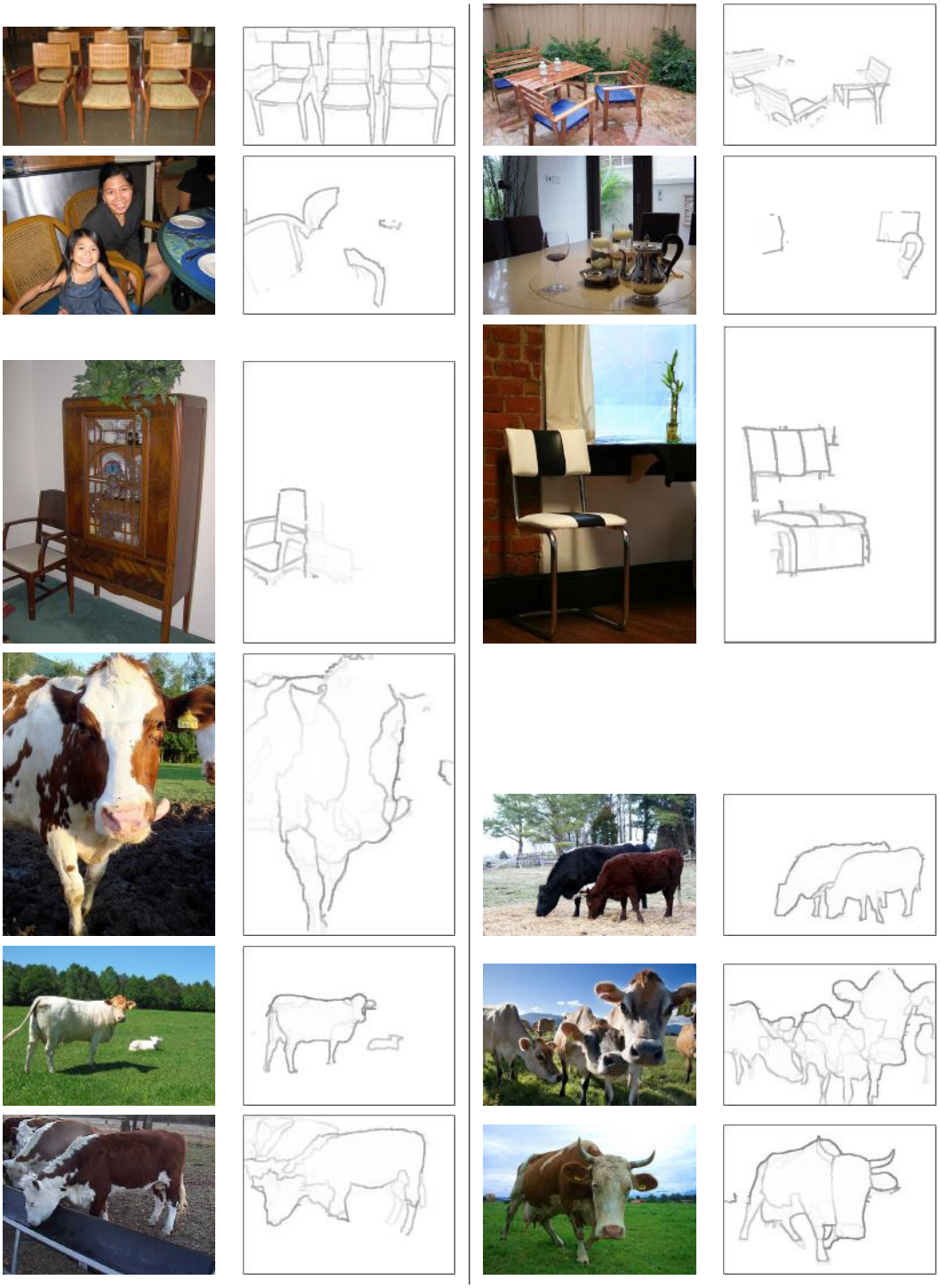




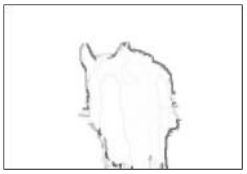


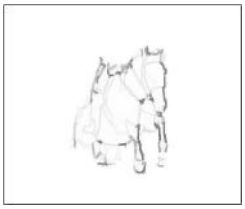


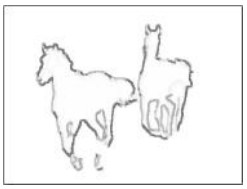

HIGHWAY PATR

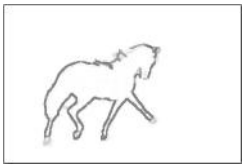


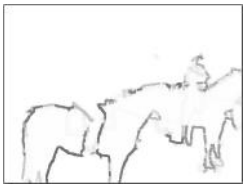


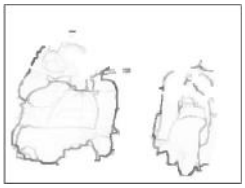





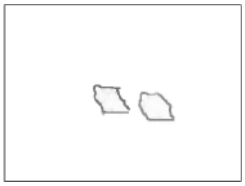


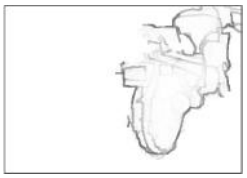


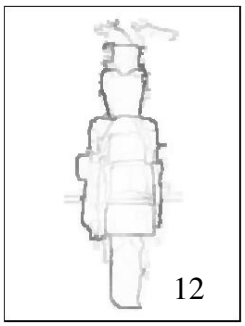


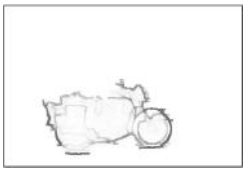




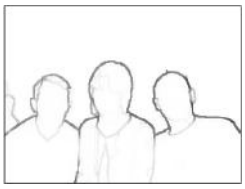


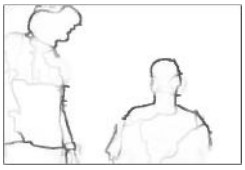


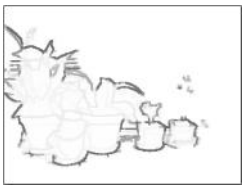




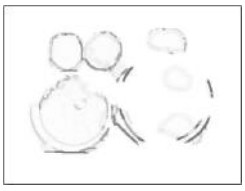


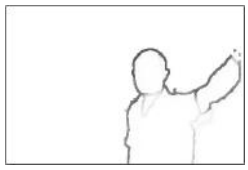


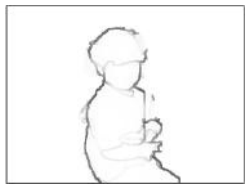


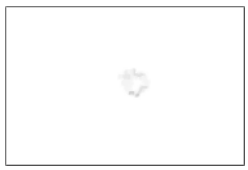


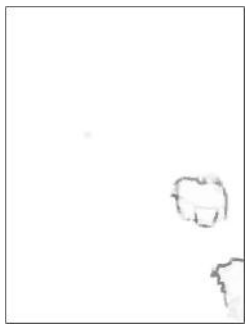












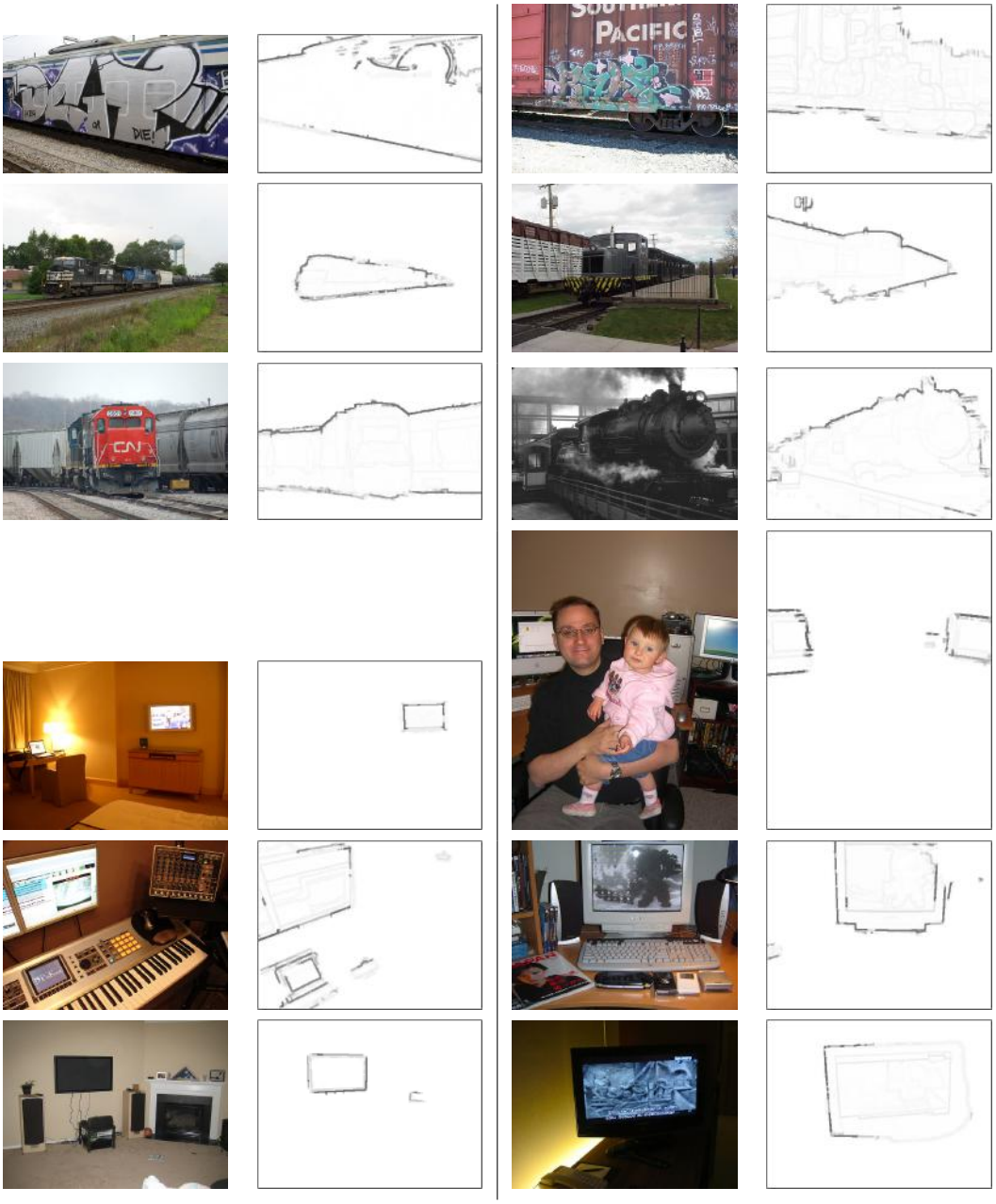


Table 3: Results on COCO dataset

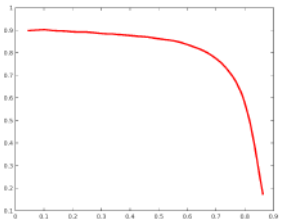
class	baseline	NN	Seg	pc+mask	class	baseline	NN	Seg	pc+mask
1	0.78372	0.85781	0.62572	0.5674	2	0.52391	0.5935	0.46581	0.3823
3	0.44266	0.45567	0.47378	0.0135	4	0.66381	0.73818	0.57119	0.4857
5	0.61285	0.68534	0.53603	0.1559	6	0.63666	0.71768	0.57686	0.4349
7	0.57538	0.67185	0.51108	0.4502	8	0.29028	0.33894	0.31598	0.1159
9	0.36991	0.4401	0.33511	0.353	10	0.33677	0.37607	0.32598	0.2108
11	0.68566	0.74	0.52752	0.4731	13	0.43033	0.50699	0.50885	0.246
14	0.33515	0.47582	0.40563	0.1066	15	0.156	0.16515	0.2063	0.075
16	0.54205	0.56144	0.48371	0.4729	17	0.63002	0.6921	0.47807	0.5583
18	0.58967	0.74338	0.64503	0.4253	19	0.6413	0.70216	0.56165	0.2751
20	0.61063	0.67954	0.56708	0.568	21	0.6546	0.77275	0.61919	0.5377
22	0.8653	0.8924	0.90394	0.4838	23	0.48032	0.59826	0.43515	0.286
24	0.84323	0.89682	0.69445	0.6714	25	0.86246	0.8893	0.73203	0.6267
27	0.033984	0.04396	0.14562	0.025	28	0.43084	0.50778	0.36639	0.245
31	0.42803	0.45527	0.46674	0.1964	32	0.15183	0.15942	0.26276	0.0773
33	0.31883	0.38144	0.35505	0.0423	34	0.32454	0.41324	0.3231	0.1543
35	0.16706	0.18707	0.11814	0.0027					

2 Results on COCO

Table 4: Comparison with Situtational Detector result [], etc on COCO dataset

class	Situational	Inverse	baseline	adhoc	Linear	NN	Seg	PC+mask
1	0.56	0.395	0.631	0.704	0.7432	0.7458	0.6672	0.2397
2	0.45	0.293	0.303	0.321	0.3049	0.3202	0.2868	0.2066
3	0.36	0.088	0.558	0.623	0.6627	0.6652	0.6041974	0.4713
4	0.35	0.121	0.412	0.442	0.4372	0.4458	0.3993	0.4371
5	0.19	0.234	0.381	0.417	0.4365	0.452	0.4021	0.1933
6	0.45	0.322	0.592	0.673	0.6753	0.6915	0.576645	0.4458
7	0.28	0.287	0.499	0.528	0.5287	0.5465	0.483428	0.3235
8	0.38	0.141	0.608	0.664	0.6484	0.6521	0.578919	0.3497
9	0.18	0.116	0.188	0.206	0.1994	0.2047	0.213039	0.1571
10	0.32	0.169	0.594	0.615	0.6273	0.6387	0.564522	0.2082
11	0.1	0.046	0.178	0.179	0.1758	0.1778	0.191705	0.1025
12	0.32	0.105	0.558	0.606	0.6107	0.6168	0.584648	0.3391
13	0.42	0.266	0.596	0.647	0.6539	0.6671	0.5867	0.3927
14	0.43	0.214	0.552	0.59	0.5805	0.5894	0.5189	0.3195
15	0.43	0.412	0.628	0.669	0.665	0.6732	0.5722	0.4359
16	0.2	0.09	0.291	0.335	0.3452	0.3593	0.2831	0.1034
17	0.4	0.16	0.605	0.642	0.6325	0.638	0.5802	0.1234
18	0.15	0.056	0.216	0.26	0.2703	0.2814	0.223	0.1572
19	0.36	0.143	0.46	0.509	0.5204	0.5359	0.4605	0.2202
20	0.2	0.212	0.356	0.417	0.4433	0.4512	0.3744	0.1507

2.1 Precision Recall Curves for Each Class on COCO dataset



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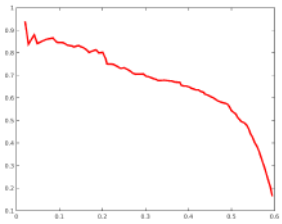

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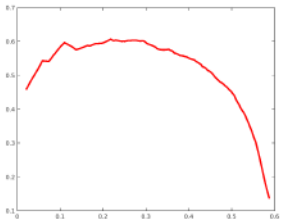

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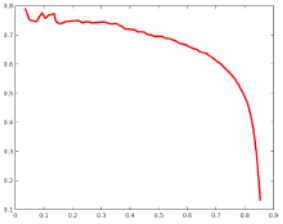

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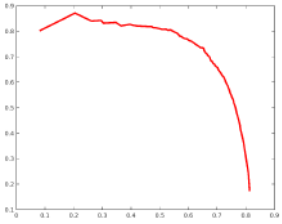

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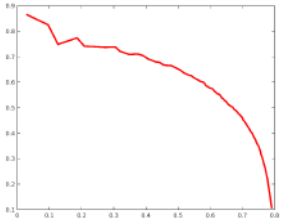

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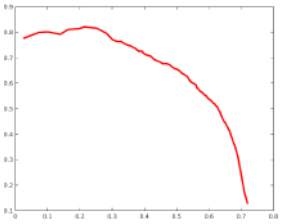

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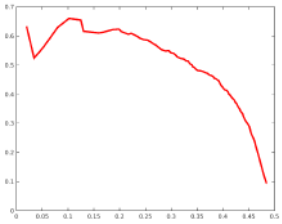

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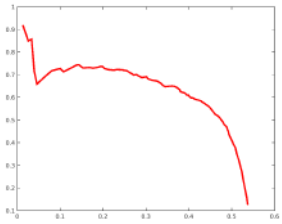

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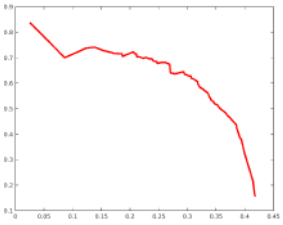

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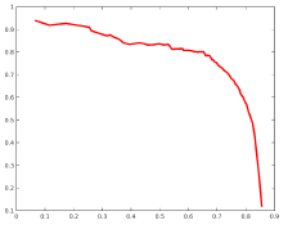

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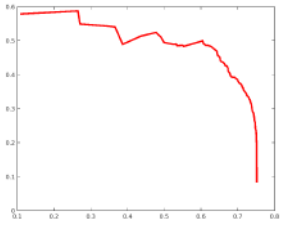

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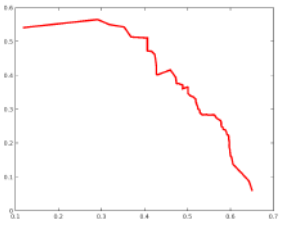

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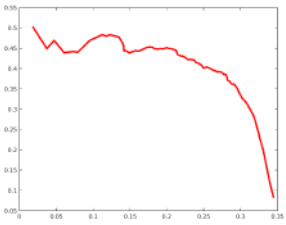

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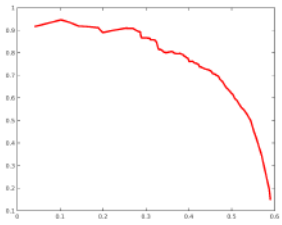

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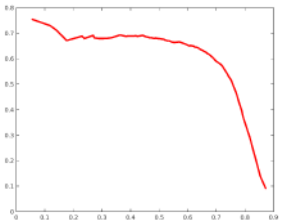

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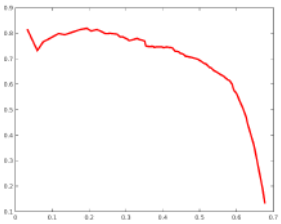

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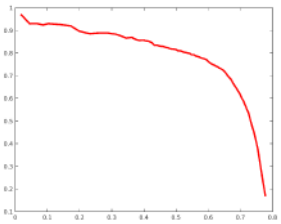

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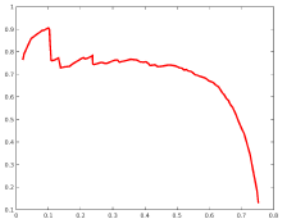

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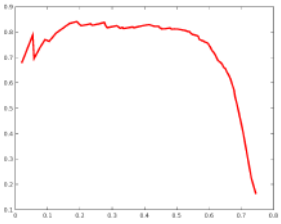

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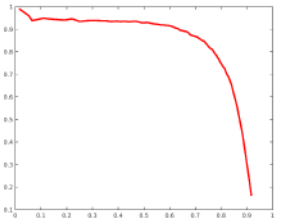

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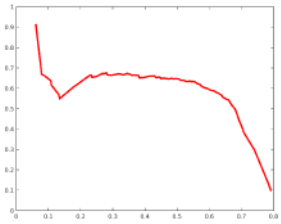

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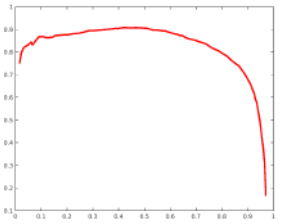

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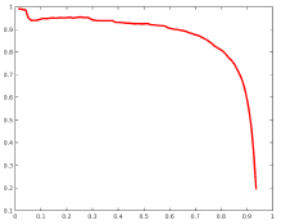

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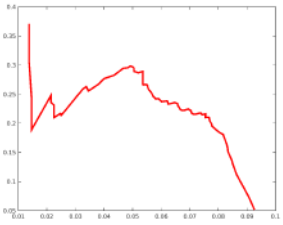

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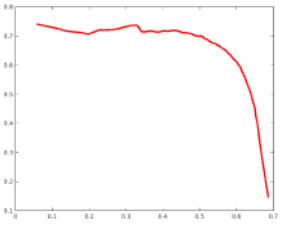

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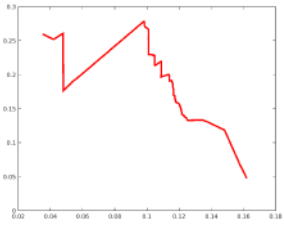

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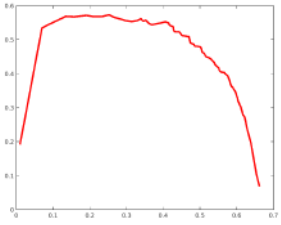

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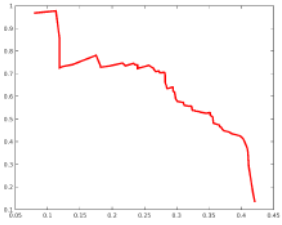

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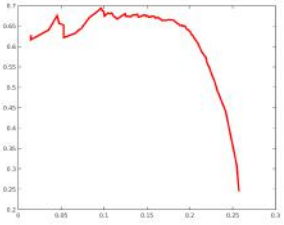

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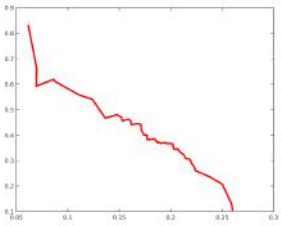

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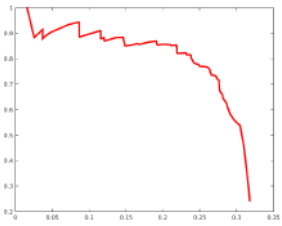

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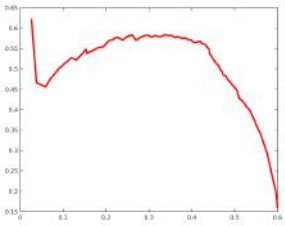

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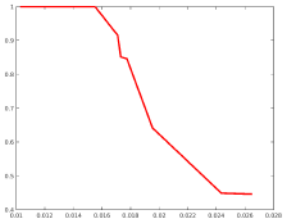

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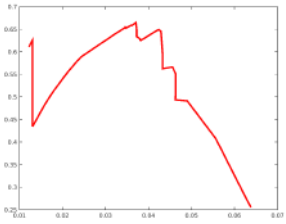

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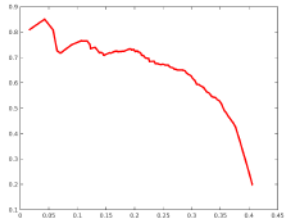

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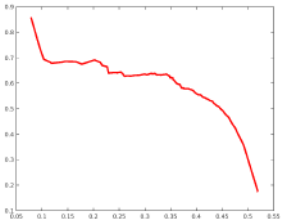

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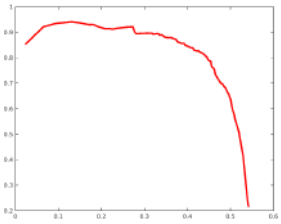

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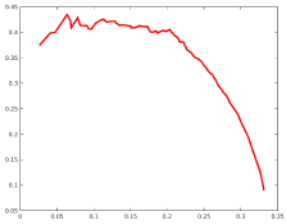

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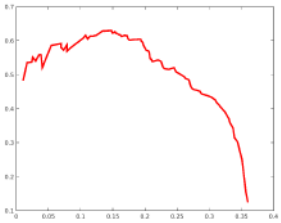

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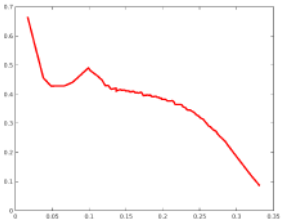

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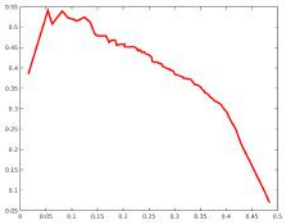

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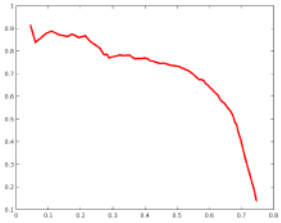

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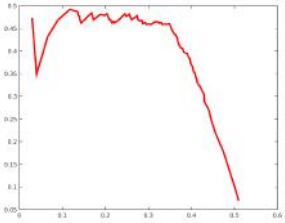

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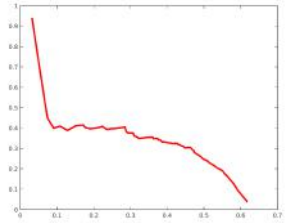

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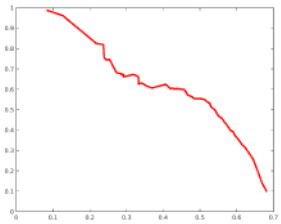

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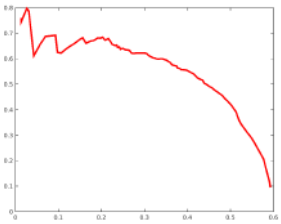

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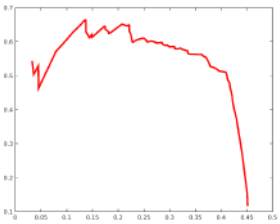

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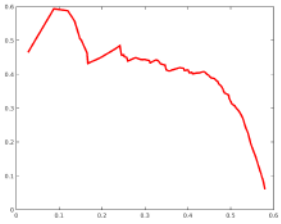

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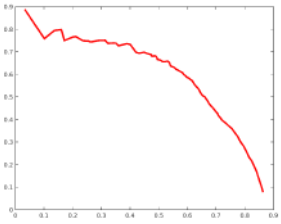

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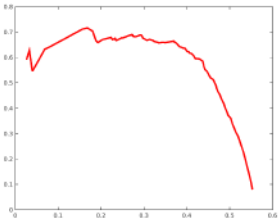

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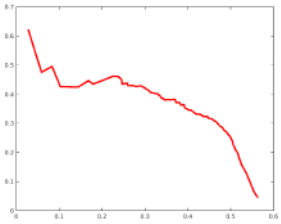

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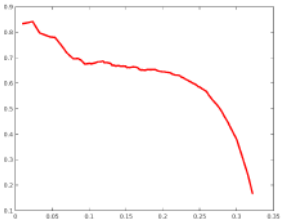

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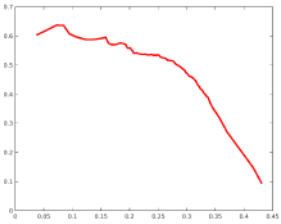

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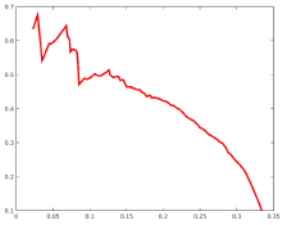

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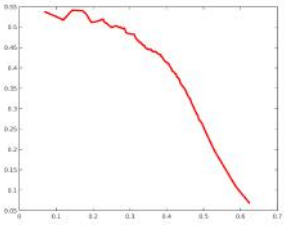

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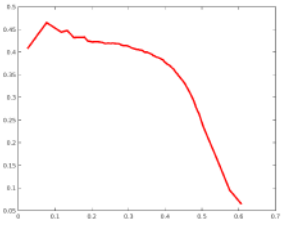

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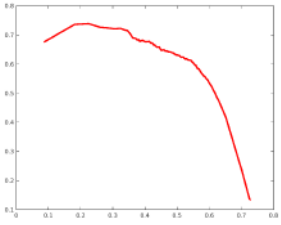

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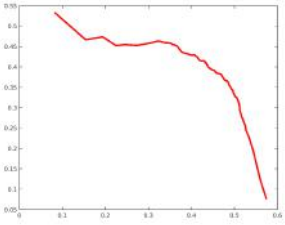

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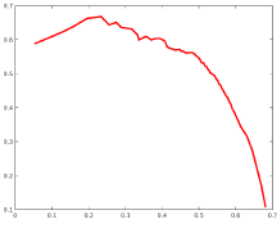

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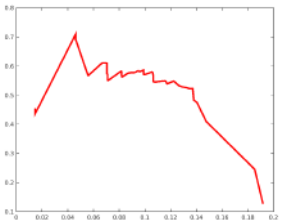

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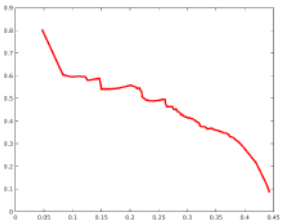

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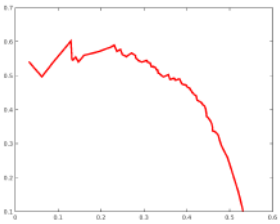

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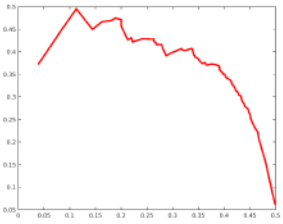

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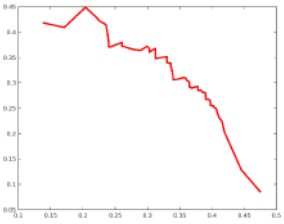

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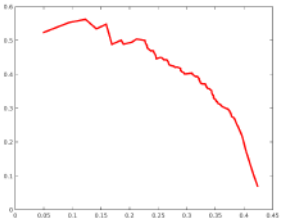

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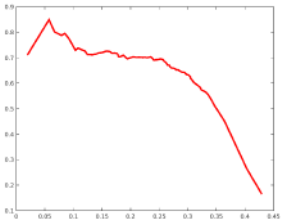

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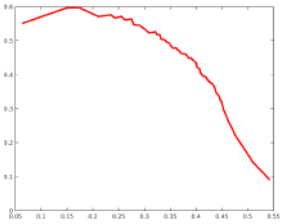

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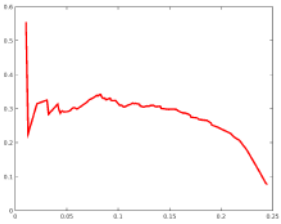

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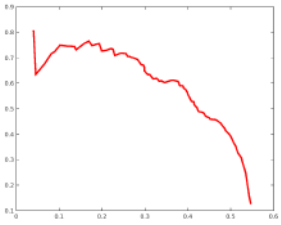

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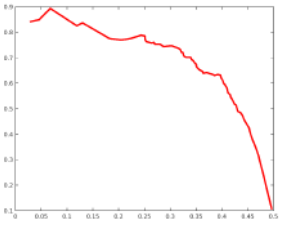

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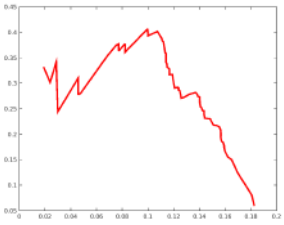

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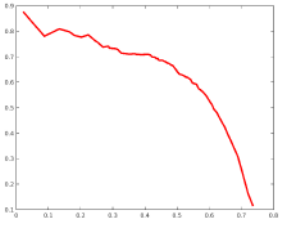

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2.2 Boundary results in class-agnostic task