

THE PATHS IN BIGNEURON DATASET OF 75 TYPICAL IMAGES USED FOR TESTING IN THE MANUSCRIPT

image1	gold166/p_checked6_mouse_RGC_uw67/ho_091202c2
image2	gold166/p_checked6_mouse_RGC_uw67/ho_091204c2
image3	gold166/p_checked6_mouse_RGC_uw67/sv_091226c2
image4	gold166/p_checked6_mouse_RGC_uw67/sv_100110c4
image5	gold166/p_checked6_mouse_RGC_uw67/ho_110203c3
image6	gold166/p_checked6_mouse_RGC_uw67/SVHO_err_140918c3
image7	gold166/p_checked6_mouse_RGC_uw67/sv_140918c8
image8	gold166/p_checked6_mouse_RGC_uw67/ho_140918c9
image9	gold166/p_checked6_mouse_RGC_uw67/sv_140921c1
image10	gold166/p_checked6_mouse_RGC_uw67/sv_140921c12
image11	gold166/p_checked6_mouse_RGC_uw67/HO_140921c14
image12	gold166/p_checked6_mouse_RGC_uw67/SV_140921c16
image13	gold166/p_checked6_mouse_RGC_uw67/HO_140921c22
image14	gold166/p_checked6_mouse_RGC_uw67/ho_140921c3
image15	gold166/p_checked6_mouse_RGC_uw67/ho_140921c5
image16	gold166/p_checked6_mouse_RGC_uw67/sv_140921c6
image17	gold166/p_checked6_mouse_RGC_uw67/ho_140921c9
image18	gold166/uint8_ChaMARCM-F000106_seg001.lsm_c_3.tif
image19	gold166/uint8_ChaMARCM-F000134_seg001.lsm_c_3.tif
image20	gold166/uint8_ChaMARCM-F000135_seg001.lsm_c_3.tif
image21	gold166/uint8_ChaMARCM-F000138_seg002.lsm_c_3.tif
image22	gold166/uint8_ChaMARCM-F000139_seg001.lsm_c_3.tif
image23	gold166/uint8_ChaMARCM-F000141_seg001.lsm_c_3.tif
image24	gold166/uint8_ChaMARCM-F000142_seg001.lsm_c_3.tif
image25	gold166/uint8_ChaMARCM-F000143_seg001.lsm_c_3.tif
image26	gold166/uint8_ChaMARCM-F000146_seg001.lsm_c_3.tif
image27	gold166/uint8_ChaMARCM-F000157_seg001.lsm_c_3.tif
image28	gold166/uint8_ChaMARCM-F000007_seg001.lsm_c_3.tif
image29	gold166/uint8_ChaMARCM-F000069_seg001.lsm_c_3.tif
image30	gold166/uint8_ChaMARCM-F000087_seg001.lsm_c_3.tif
image31	gold166/uint8_ChaMARCM-F000094_seg001.lsm_c_3.tif
image32	gold166/uint8_ChaMARCM-F000095_seg001.lsm_c_3.tif
image33	gold166/uint8_ChaMARCM-F000096_seg001.lsm_c_3.tif
image34	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_B1- left_optic_lobe.v3draw.extract_3
image35	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_B2- right_optic_lobe.v3draw.extract_0
image36	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_C7- left_optic_lobe.v3draw.extract_3
image37	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110928_6_E1- left_optic_lobe.v3draw.extract_5

image38	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-m-A02-20111101_1_D1-right_optic_lobe.v3draw.extract_9
image39	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-m-A02-20111101_2_D2-right_optic_lobe.v3draw.extract_0
image40	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-m-A02-20111101_2_E1-right_optic_lobe.v3draw.extract_9
image41	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-m-A02-20111101_2_E2-right_optic_lobe.v3draw.extract_3
image42	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-m-A02-20111101_2_F3-left_optic_lobe.v3draw.extract_6
image43	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-x-A02-20110411_1_D4-left_optic_lobe.v3draw.extract_8
image44	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-x-A02-20110612_1_B1-right_optic_lobe.v3draw.extract_7
image45	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20110929_1_D1-left_optic_lobe.v3draw.extract_0
image46	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111005_1_B5-left_optic_lobe.v3draw.extract_3
image47	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_A3-right_optic_lobe.v3draw.extract_3
image48	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_B2-right_optic_lobe.v3draw.extract_2
image49	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-m-A02-20111101_2_E2-left_optic_lobe.v3draw.extract_4
image50	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111028_4_A5-right_optic_lobe.v3draw.extract_0
image51	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111103_2_D3-left_optic_lobe.v3draw.extract_0
image52	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111107_2_C5-right_optic_lobe.v3draw.extract_0
image53	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111108_2_B3-right_optic_lobe.v3draw.extract_5
image54	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111108_2_F3-right_optic_lobe.v3draw.extract_0
image55	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111108_4_E3-left_optic_lobe.v3draw.extract_1
image56	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-f-A-20111108_4_G2-right_optic_lobe.v3draw.extract_1
image57	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111004_3_E2-left_optic_lobe.v3draw.extract_0
image58	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111005_4_B1-right_optic_lobe.v3draw.extract_0

image59	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111005_4_C6-right_optic_lobe.v3draw.extract_0
image60	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111005_5_B5-left_optic_lobe.v3draw.extract_0
image61	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111006_1_A4-right_optic_lobe.v3draw.extract_0
image62	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111006_1_E1-right_optic_lobe.v3draw.extract_4
image63	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111103_3_D1-left_optic_lobe.v3draw.extract_0
image64	gold166/GMR_57C10_AD_01-Two_recombinase_flipouts_A-m-A-20111103_3_F3-right_optic_lobe.v3draw.extract_10
image65	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_A2-right_optic_lobe.v3draw.extract_0
image66	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_A3-left_optic_lobe.v3draw.extract_6
image67	gold166/GMR_57C10_AD_01-1xLwt_attp40_4stop1-f-A01-20110325_3_A5-left_optic_lobe.v3draw.extract_2
image68	gold166/p_checked6_fruitfly_larvae_gmu23/done_1_CL-I_X_OREGON_R_ddaD_membrane-GFP
image69	gold166/p_checked6_fruitfly_larvae_gmu23/done_err_3_CL-I_MT_X_MYR-GFP_ddaE_MT-mCherry_membrane-GFP.czi_C_1
image70	gold166/p_checked6_fruitfly_larvae_gmu23/done_Result_of_C1-CL-I(X-Mas)_x_OregonR_ddaD_F-actinGFP_MT-Red
image71	gold166/p_checked6_fruitfly_larvae_gmu23/done_Result_of_C1-CL-I(X-Mas)_x_OregonR_ddaE_F-actinGFP_MT-Red
image72	gold166/p_checked6_fruitfly_larvae_gmu23/done_1_CL-I_X_OREGON_R_ddaE_membrane-GFP
image73	gold166/p_checked6_fruitfly_larvae_gmu23/done_2_CL-I_Membrane-GFP_X_F-Actin-Red_ddaD_Membrane-GFP_F-Actin-Red.czi_C_1
image74	gold166/p_checked6_fruitfly_larvae_gmu23/done_2_CL-I_Membrane-GFP_X_F-Actin-Red_ddaE_Membrane-GFP_F-Actin-Red.czi_C_1
image75	gold166/p_checked6_fruitfly_larvae_gmu23/done_3_CL-I_MT_X_MYR-GFP_ddaD_MT-mCherry_membrane-GFP.czi_C_1

TABLE I
AVERAGE RESULTS OF DIFFERENT METHODS ON THE BIGNEURON DATASET

	SD	SSD	PRECISION	RECALL	F1	MES
APP2	10.614	17.311	0.795	0.731	0.765	0.592
ENT	12.565	16.809	0.507	0.512	0.497	0.320
FMST	7.623	14.108	0.673	0.663	0.664	0.506
ON	7.946	13.787	0.590	0.599	0.589	0.473
TopNet	7.080	11.53	0.709	0.563	0.624	0.408
Hybrid	11.276	13.827	0.272	0.533	0.357	0.226
3D tubular flux model (Ours)	5.045	12.956	0.826	0.747	0.781	0.616

TABLE II
QUANTITATIVE RESULTS OF APP2 ON EACH IMAGE

	SD	SSD	PRECISION	RECALL	F1	MES
image1	11.053	19.845	0.629	0.536	0.579	0.359
image2	11.222	18.125	0.560	0.468	0.510	0.282
image3	18.552	26.776	0.433	0.387	0.409	0.218
image4	29.831	42.635	0.563	0.445	0.497	0.242
image5	24.826	36.214	0.599	0.466	0.524	0.258
image6	7.055	17.835	0.692	0.624	0.656	0.463
image7	18.729	47.560	0.611	0.643	0.627	0.467
image8	10.064	21.282	0.858	0.643	0.735	0.482
image9	11.114	26.482	0.643	0.574	0.607	0.406
image10	5.533	14.229	0.878	0.704	0.782	0.581
image11	4.981	10.729	0.875	0.653	0.748	0.498
image12	5.309	11.831	0.822	0.662	0.733	0.515
image13	7.540	19.819	0.714	0.627	0.668	0.468
image14	6.574	19.542	0.727	0.668	0.696	0.515
image15	237.012	237.012	-	-	-	-
image16	8.205	25.019	0.746	0.677	0.710	0.528
image17	2.821	7.866	0.910	0.740	0.816	0.637
image18	1.425	4.446	0.896	0.774	0.831	0.684
image19	2.708	6.465	0.573	0.881	0.694	0.535
image20	0.910	4.505	0.954	0.930	0.941	0.890
image21	0.763	3.339	0.971	0.912	0.941	0.884
image22	0.901	3.136	0.991	0.877	0.930	0.855
image23	0.807	3.715	0.950	0.931	0.940	0.888
image24	0.775	3.047	0.969	0.918	0.943	0.889
image25	1.360	5.041	0.797	0.933	0.860	0.761
image26	1.200	4.243	0.935	0.830	0.880	0.770
image27	1.310	4.827	0.956	0.818	0.882	0.763
image28	1.621	5.927	0.962	0.814	0.882	0.759
image29	5.109	8.256	0.333	0.769	0.465	0.291
image30	0.872	3.380	0.956	0.917	0.936	0.878
image31	0.793	4.355	0.930	0.936	0.933	0.874
image32	2.669	7.336	0.635	0.826	0.718	0.587
image33	0.724	3.191	0.972	0.924	0.947	0.897
image34	1.054	3.513	0.865	0.889	0.877	0.787
image35	0.920	3.867	0.914	0.904	0.909	0.835
image36	0.923	3.364	0.884	0.928	0.906	0.832
image37	0.879	2.743	0.930	0.905	0.917	0.848
image38	0.789	3.522	0.947	0.943	0.945	0.897
image39	1.132	3.989	0.938	0.828	0.880	0.767
image40	1.241	6.701	0.921	0.896	0.908	0.833

image41	1.094	3.962	0.925	0.878	0.901	0.818
image42	1.157	5.058	0.865	0.933	0.898	0.821
image43	1.890	6.234	0.722	0.902	0.802	0.682
image44	2.289	4.667	0.559	0.769	0.648	0.485
image45	0.958	4.666	0.919	0.925	0.922	0.860
image46	1.413	5.393	0.981	0.833	0.901	0.791
image47	1.258	5.012	0.939	0.853	0.894	0.797
image48	1.124	3.750	0.890	0.873	0.881	0.791
image49	1.201	5.482	0.826	0.939	0.879	0.786
image50	0.178	3.555	0.996	0.949	0.972	0.942
image51	2.049	7.490	0.875	0.783	0.827	0.684
image52	47.285	75.674	0.721	0.536	0.615	0.330
image53	3.243	7.273	0.855	0.708	0.774	0.588
image54	5.374	8.875	0.787	0.578	0.667	0.385
image55	33.165	55.412	0.909	0.605	0.726	0.391
image56	2.331	4.069	0.781	0.642	0.705	0.497
image57	5.441	8.357	0.779	0.552	0.646	0.335
image58	2.559	4.857	0.814	0.676	0.738	0.542
image59	1.843	3.296	0.843	0.714	0.774	0.596
image60	3.838	7.120	0.826	0.632	0.716	0.471
image61	44.861	59.419	0.816	0.519	0.635	0.233
image62	2.091	3.690	0.798	0.688	0.739	0.556
image63	3.913	5.888	0.741	0.539	0.624	0.330
image64	4.868	13.004	0.888	0.733	0.803	0.628
image65	4.878	7.684	0.922	0.600	0.727	0.375
image66	37.053	51.750	0.858	0.545	0.666	0.271
image67	5.104	7.215	0.694	0.499	0.581	0.272
image68	4.757	13.363	0.679	0.702	0.690	0.532
image69	13.462	36.673	0.628	0.825	0.713	0.572
image70	7.254	16.453	0.870	0.649	0.743	0.491
image71	54.361	78.043	0.278	0.553	0.370	0.259
image72	11.899	23.127	0.479	0.576	0.523	0.378
image73	16.861	48.805	0.658	0.782	0.715	0.574
image74	12.863	36.520	0.653	0.767	0.706	0.560
image75	28.520	54.270	0.458	0.666	0.543	0.403

TABLE III
QUANTITATIVE RESULTS OF ENT ON EACH IMAGE

	SD	SSD	PRECISION	RECALL	F1	MES
image1	12.265	25.078	0.566	0.547	0.556	0.365
image2	19.449	31.992	0.474	0.439	0.456	0.265
image3	109.050	131.101	0.390	0.318	0.350	0.127
image4	44.847	64.684	0.532	0.433	0.478	0.233
image5	26.458	40.983	0.460	0.418	0.438	0.241
image6	48.829	55.485	0.568	0.389	0.462	0.098
image7	38.843	45.556	0.741	0.460	0.567	0.123
image8	33.866	54.643	0.381	0.596	0.465	0.286
image9	14.304	23.732	0.403	0.595	0.480	0.308
image10	2.638	4.323	0.435	0.675	0.529	0.320
image11	3.295	4.741	0.298	0.552	0.387	0.221
image12	2.439	3.642	0.376	0.601	0.463	0.267
image13	5.164	7.794	0.349	0.576	0.435	0.249
image14	44.316	50.349	0.844	0.486	0.617	0.105
image15	2.405	4.360	0.441	0.690	0.538	0.333
image16	4.746	8.063	0.438	0.626	0.515	0.312
image17	3.549	4.924	0.269	0.523	0.355	0.196
image18	6.458	7.515	0.096	0.236	0.137	0.067
image19	1.739	3.326	0.872	0.729	0.794	0.619
image20	5.498	6.659	0.150	0.366	0.213	0.116
image21	2.403	3.943	0.564	0.626	0.593	0.431
image22	1.991	3.300	0.705	0.620	0.660	0.466
image23	2.047	3.044	0.601	0.589	0.595	0.429
image24	1.725	2.988	0.809	0.715	0.759	0.591
image25	6.026	6.908	0.099	0.158	0.122	0.072
image26	1.900	2.888	0.622	0.618	0.620	0.447
image27	1.781	3.286	0.743	0.736	0.740	0.580
image28	1.750	3.159	0.674	0.732	0.702	0.547
image29	2.030	3.592	0.809	0.680	0.739	0.545
image30	2.053	2.956	0.507	0.579	0.541	0.381
image31	1.958	3.288	0.640	0.664	0.652	0.487
image32	6.235	7.230	0.092	0.252	0.134	0.068
image33	1.599	2.952	0.809	0.751	0.779	0.632
image34	5.443	6.529	0.139	0.257	0.180	0.107
image35	2.616	3.295	0.312	0.341	0.326	0.211
image36	3.294	4.032	0.237	0.279	0.256	0.163
image37	2.309	3.328	0.453	0.493	0.472	0.319
image38	4.836	5.978	0.148	0.273	0.192	0.119
image39	1.907	3.148	0.646	0.646	0.646	0.484
image40	3.231	4.249	0.286	0.361	0.319	0.207

image41	3.769	4.747	0.230	0.304	0.262	0.172
image42	6.753	7.580	0.071	0.135	0.093	0.057
image43	7.437	8.628	0.057	0.159	0.084	0.040
image44	4.951	6.002	0.164	0.209	0.184	0.119
image45	1.749	3.010	0.730	0.703	0.716	0.557
image46	1.955	3.437	0.769	0.715	0.741	0.575
image47	2.138	3.399	0.610	0.598	0.604	0.429
image48	2.563	3.424	0.332	0.399	0.362	0.240
image49	6.568	7.880	0.119	0.319	0.174	0.083
image50	6.600	7.739	0.105	0.290	0.154	0.069
image51	3.139	4.271	0.342	0.419	0.376	0.255
image52	2.009	3.514	0.705	0.666	0.685	0.512
image53	3.048	7.728	0.895	0.752	0.817	0.655
image54	2.138	4.044	0.759	0.678	0.716	0.535
image55	2.050	4.331	0.864	0.750	0.803	0.643
image56	14.050	18.346	0.676	0.468	0.553	0.210
image57	2.696	4.588	0.721	0.605	0.658	0.446
image58	10.966	22.864	0.864	0.653	0.744	0.502
image59	-	-	-	-	-	-
image60	21.903	30.652	0.694	0.493	0.576	0.255
image61	41.096	61.476	0.835	0.556	0.668	0.315
image62	1.694	3.215	0.859	0.767	0.811	0.665
image63	2.405	4.250	0.677	0.619	0.646	0.460
image64	41.871	43.574	0.729	0.430	0.541	0.035
image65	2.515	5.075	0.804	0.683	0.739	0.547
image66	30.428	49.775	0.775	0.560	0.650	0.354
image67	2.603	4.403	0.631	0.592	0.611	0.427
image68	13.891	25.567	0.644	0.546	0.591	0.366
image69	1.894	5.463	0.764	0.871	0.814	0.686
image70	80.387	86.042	0.049	0.116	0.069	0.044
image71	66.986	72.578	0.060	0.189	0.091	0.043
image72	2.752	5.103	0.473	0.598	0.528	0.376
image73	1.511	3.696	0.723	0.808	0.763	0.603
image74	1.820	4.107	0.633	0.778	0.698	0.509
image75	20.091	42.049	0.850	0.643	0.732	0.481

TABLE IV
QUANTITATIVE RESULTS OF FMST ON EACH IMAGE

	SD	SSD	PRECISION	RECALL	F1	MES
image1	8.852	14.729	0.463	0.434	0.448	0.272
image2	17.047	25.914	0.374	0.354	0.364	0.208
image3	15.378	21.861	0.429	0.379	0.403	0.213
image4	9.552	13.864	0.416	0.380	0.397	0.221
image5	11.247	16.606	0.441	0.390	0.414	0.223
image6	22.493	51.471	0.568	0.667	0.614	0.464
image7	29.359	51.585	0.428	0.554	0.483	0.350
image8	19.942	63.686	0.697	0.706	0.701	0.544
image9	56.141	109.336	0.483	0.678	0.564	0.424
image10	2.206	6.403	0.827	0.768	0.797	0.648
image11	4.119	12.916	0.756	0.704	0.729	0.563
image12	7.038	27.462	0.769	0.769	0.769	0.626
image13	14.129	44.852	0.690	0.769	0.728	0.586
image14	7.258	19.138	0.654	0.657	0.655	0.490
image15	12.384	35.337	0.694	0.597	0.642	0.432
image16	5.162	16.095	0.714	0.752	0.732	0.585
image17	12.161	35.870	0.677	0.708	0.692	0.539
image18	1.732	3.857	0.783	0.735	0.758	0.586
image19	1.817	3.211	0.616	0.656	0.636	0.464
image20	2.006	5.411	0.798	0.731	0.763	0.588
image21	1.093	3.513	0.946	0.891	0.918	0.839
image22	1.476	3.359	0.900	0.746	0.816	0.648
image23	2.349	6.645	0.752	0.758	0.755	0.602
image24	1.413	3.181	0.918	0.749	0.825	0.653
image25	1.812	4.063	0.801	0.704	0.749	0.566
image26	1.870	4.828	0.804	0.733	0.767	0.600
image27	1.658	5.912	0.886	0.787	0.833	0.695
image28	1.943	4.919	0.874	0.732	0.797	0.622
image29	1.835	3.266	0.620	0.671	0.644	0.471
image30	1.414	4.258	0.852	0.836	0.844	0.712
image31	1.624	3.766	0.769	0.791	0.780	0.620
image32	1.781	5.008	0.821	0.764	0.791	0.637
image33	1.260	2.995	0.912	0.807	0.856	0.726
image34	1.575	3.271	0.795	0.752	0.773	0.615
image35	1.591	3.054	0.789	0.719	0.752	0.583
image36	1.662	3.135	0.786	0.696	0.739	0.563
image37	1.562	3.140	0.782	0.753	0.767	0.613
image38	1.718	3.221	0.659	0.706	0.681	0.514
image39	1.953	3.674	0.692	0.650	0.670	0.500
image40	1.663	3.895	0.767	0.774	0.771	0.616

image41	1.688	3.419	0.723	0.719	0.721	0.554
image42	1.565	3.150	0.802	0.717	0.757	0.582
image43	2.106	3.791	0.621	0.609	0.615	0.432
image44	2.240	3.244	0.480	0.482	0.481	0.320
image45	1.515	3.485	0.816	0.762	0.788	0.644
image46	1.671	5.112	0.956	0.786	0.863	0.716
image47	1.810	3.647	0.687	0.707	0.697	0.525
image48	1.490	3.100	0.724	0.781	0.751	0.593
image49	1.328	3.216	0.797	0.869	0.831	0.681
image50	1.798	3.426	0.713	0.688	0.700	0.520
image51	1.739	3.509	0.692	0.704	0.698	0.526
image52	1.986	3.064	0.617	0.636	0.626	0.459
image53	1.840	2.807	0.696	0.681	0.689	0.521
image54	2.138	3.389	0.649	0.610	0.629	0.446
image55	1.818	3.132	0.782	0.720	0.750	0.587
image56	2.105	3.018	0.596	0.567	0.581	0.403
image57	2.164	3.580	0.682	0.627	0.653	0.472
image58	1.936	2.904	0.690	0.645	0.667	0.489
image59	1.687	2.726	0.787	0.731	0.758	0.599
image60	2.482	3.522	0.550	0.510	0.529	0.345
image61	1.890	2.828	0.675	0.642	0.658	0.479
image62	1.757	2.569	0.721	0.689	0.705	0.534
image63	2.349	3.449	0.477	0.530	0.502	0.352
image64	1.745	2.756	0.719	0.725	0.722	0.570
image65	1.755	2.986	0.726	0.703	0.714	0.548
image66	1.938	2.978	0.592	0.652	0.620	0.462
image67	2.254	3.515	0.547	0.563	0.555	0.385
image68	58.886	72.742	0.188	0.300	0.231	0.155
image69	36.464	43.701	0.164	0.235	0.193	0.126
image70	41.963	66.775	0.355	0.563	0.436	0.312
image71	59.833	71.458	0.155	0.511	0.238	0.140
image72	79.035	90.368	0.123	0.173	0.144	0.098
image73	15.992	18.887	0.149	0.199	0.170	0.117
image74	18.009	22.398	0.197	0.249	0.220	0.150
image75	31.871	38.020	0.158	0.258	0.196	0.124

TABLE V
QUANTITATIVE RESULTS OF ON ON EACH IMAGE

	SD	SSD	PRECISION	RECALL	F1	MES
image1	8.517	16.273	0.501	0.581	0.538	0.420
image2	25.905	38.432	0.318	0.458	0.375	0.298
image3	11.365	14.237	0.180	0.247	0.208	0.168
image4	12.297	19.174	0.328	0.443	0.377	0.294
image5	5.289	10.518	0.549	0.565	0.557	0.416
image6	27.909	48.663	0.428	0.642	0.513	0.414
image7	27.459	46.532	0.410	0.617	0.492	0.395
image8	29.318	72.984	0.605	0.706	0.651	0.531
image9	65.307	102.498	0.363	0.594	0.451	0.361
image10	2.888	8.393	0.744	0.798	0.770	0.659
image11	3.588	8.399	0.656	0.713	0.684	0.561
image12	3.660	9.042	0.684	0.734	0.708	0.586
image13	17.969	38.820	0.549	0.701	0.616	0.503
image14	6.447	16.459	0.640	0.738	0.685	0.569
image15	10.736	31.719	0.689	0.672	0.680	0.532
image16	5.691	13.159	0.614	0.707	0.657	0.539
image17	10.789	25.677	0.602	0.719	0.655	0.540
image18	2.451	3.329	0.495	0.463	0.479	0.323
image19	5.991	7.049	0.131	0.175	0.150	0.134
image20	1.872	3.163	0.688	0.672	0.680	0.549
image21	2.023	3.271	0.723	0.661	0.691	0.535
image22	2.086	3.438	0.808	0.620	0.702	0.472
image23	2.751	4.976	0.643	0.582	0.611	0.445
image24	2.285	3.558	0.767	0.590	0.667	0.424
image25	2.413	4.135	0.701	0.596	0.645	0.454
image26	2.429	3.676	0.589	0.532	0.559	0.389
image27	2.287	4.022	0.630	0.658	0.644	0.527
image28	2.044	3.544	0.693	0.651	0.672	0.523
image29	6.447	7.357	0.043	0.080	0.056	0.019
image30	1.721	3.008	0.783	0.728	0.755	0.620
image31	2.005	3.243	0.645	0.639	0.642	0.507
image32	6.080	6.951	0.102	0.127	0.114	0.099
image33	2.005	3.115	0.759	0.618	0.681	0.474
image34	3.115	3.893	0.352	0.324	0.337	0.196
image35	2.450	3.279	0.530	0.457	0.491	0.307
image36	3.410	4.317	0.397	0.351	0.372	0.206
image37	2.795	3.622	0.407	0.377	0.391	0.249
image38	2.178	3.561	0.616	0.589	0.602	0.455
image39	3.361	4.443	0.572	0.443	0.499	0.247
image40	2.738	3.825	0.426	0.449	0.437	0.328

image41	2.384	3.355	0.501	0.472	0.486	0.337
image42	5.422	7.214	0.284	0.322	0.302	0.237
image43	7.135	9.482	0.236	0.280	0.256	0.198
image44	5.905	6.299	0.102	0.098	0.100	0.041
image45	2.320	3.529	0.591	0.532	0.560	0.396
image46	1.779	3.083	0.769	0.773	0.771	0.663
image47	2.113	3.190	0.584	0.574	0.579	0.438
image48	2.785	3.257	0.270	0.265	0.267	0.169
image49	3.672	6.153	0.448	0.619	0.520	0.422
image50	3.113	4.566	0.509	0.461	0.484	0.319
image51	2.460	3.640	0.500	0.507	0.504	0.361
image52	1.207	3.530	0.880	0.815	0.846	0.737
image53	0.872	3.079	0.943	0.922	0.933	0.884
image54	1.417	3.823	0.791	0.784	0.787	0.677
image55	0.959	3.242	0.919	0.870	0.894	0.815
image56	1.273	3.822	0.882	0.815	0.847	0.742
image57	1.256	3.996	0.888	0.829	0.858	0.761
image58	0.912	3.023	0.931	0.881	0.905	0.834
image59	0.860	2.889	0.964	0.897	0.929	0.867
image60	1.296	3.936	0.854	0.803	0.828	0.713
image61	0.976	3.733	0.942	0.891	0.916	0.848
image62	0.745	3.025	0.980	0.931	0.955	0.914
image63	1.623	3.501	0.736	0.697	0.716	0.577
image64	0.732	2.991	0.971	0.950	0.961	0.928
image65	1.247	3.292	0.865	0.790	0.826	0.708
image66	1.150	3.915	0.910	0.849	0.878	0.786
image67	1.630	3.751	0.833	0.710	0.767	0.603
image68	63.613	77.092	0.174	0.239	0.201	0.162
image69	36.564	63.674	0.429	0.689	0.529	0.427
image70	20.125	58.966	0.663	0.747	0.703	0.583
image71	44.584	54.058	0.170	0.491	0.252	0.179
image72	68.270	77.644	0.121	0.147	0.132	0.109
image73	12.552	23.960	0.482	0.652	0.554	0.439
image74	14.107	31.979	0.571	0.702	0.630	0.506
image75	21.924	38.171	0.432	0.664	0.523	0.425

TABLE VI
QUANTITATIVE RESULTS OF H-Net ON EACH IMAGE

	SD	SSD	PRECISION	RECALL	F1	MES
image1	18.361	22.805	0.171	0.308	0.220	0.131
image2	19.967	23.402	0.107	0.212	0.143	0.084
image3	14.539	16.120	0.050	0.058	0.054	0.039
image4	10.240	12.560	0.145	0.177	0.160	0.105
image5	9.672	12.025	0.150	0.195	0.170	0.110
image6	105.974	107.694	0.017	0.017	0.017	0.002
image7	24.196	30.819	0.199	0.487	0.282	0.156
image8	28.069	39.414	0.278	0.509	0.360	0.217
image9	78.934	99.640	0.202	0.550	0.296	0.162
image10	2.772	5.531	0.455	0.690	0.549	0.355
image11	4.118	6.390	0.304	0.557	0.393	0.240
image12	4.617	7.645	0.352	0.681	0.464	0.282
image13	15.411	21.785	0.268	0.602	0.371	0.216
image14	6.662	10.147	0.309	0.609	0.410	0.238
image15	9.315	14.202	0.329	0.531	0.407	0.246
image16	6.497	9.444	0.284	0.582	0.382	0.225
image17	9.196	14.184	0.325	0.678	0.439	0.261
image18	2.292	3.769	0.376	0.643	0.474	0.282
image19	6.555	7.715	0.070	0.207	0.104	0.051
image20	2.616	4.147	0.317	0.642	0.424	0.286
image21	2.168	3.668	0.427	0.720	0.536	0.346
image22	2.156	3.560	0.426	0.628	0.507	0.363
image23	3.414	5.449	0.370	0.676	0.478	0.318
image24	2.219	3.614	0.407	0.657	0.502	0.322
image25	2.416	3.963	0.506	0.571	0.537	0.395
image26	2.542	3.770	0.277	0.613	0.382	0.188
image27	2.775	4.164	0.287	0.658	0.399	0.231
image28	2.738	4.123	0.250	0.583	0.350	0.199
image29	7.794	8.513	0.032	0.130	0.052	0.023
image30	2.225	3.763	0.435	0.731	0.545	0.399
image31	2.626	3.947	0.311	0.623	0.415	0.280
image32	5.045	5.949	0.077	0.331	0.125	0.048
image33	2.342	3.906	0.414	0.659	0.509	0.355
image34	2.544	3.634	0.254	0.576	0.353	0.171
image35	2.254	3.837	0.450	0.655	0.534	0.404
image36	2.913	3.834	0.200	0.415	0.269	0.160
image37	2.408	3.775	0.317	0.591	0.412	0.227
image38	2.283	3.575	0.381	0.694	0.492	0.329
image39	2.273	3.554	0.348	0.594	0.439	0.248
image40	2.896	4.205	0.264	0.650	0.376	0.217

image41	2.655	3.714	0.234	0.539	0.326	0.188
image42	4.721	5.923	0.165	0.318	0.217	0.152
image43	4.442	6.443	0.280	0.493	0.357	0.245
image44	2.886	3.974	0.237	0.409	0.300	0.145
image45	2.141	3.413	0.362	0.734	0.485	0.275
image46	2.358	4.006	0.381	0.736	0.502	0.318
image47	2.847	4.449	0.276	0.629	0.384	0.222
image48	2.279	3.517	0.307	0.646	0.417	0.207
image49	4.587	5.958	0.160	0.571	0.250	0.131
image50	3.066	4.648	0.302	0.513	0.380	0.223
image51	2.579	3.899	0.306	0.558	0.395	0.224
image52	2.559	3.842	0.295	0.661	0.408	0.261
image53	2.484	3.856	0.398	0.691	0.505	0.394
image54	2.629	3.811	0.247	0.647	0.358	0.222
image55	2.435	4.017	0.360	0.739	0.484	0.340
image56	2.373	3.920	0.353	0.666	0.462	0.343
image57	2.414	3.639	0.298	0.637	0.406	0.279
image58	2.243	3.690	0.399	0.733	0.517	0.386
image59	2.339	3.923	0.398	0.801	0.531	0.368
image60	2.807	4.395	0.280	0.603	0.382	0.243
image61	2.284	3.772	0.371	0.741	0.495	0.340
image62	2.514	4.001	0.404	0.712	0.515	0.391
image63	2.876	4.001	0.222	0.478	0.303	0.191
image64	2.556	4.179	0.377	0.725	0.496	0.367
image65	2.300	3.482	0.342	0.635	0.444	0.316
image66	2.856	4.151	0.266	0.585	0.366	0.255
image67	-	-	-	-	-	-
image68	58.101	62.724	0.066	0.088	0.075	0.051
image69	15.808	19.267	0.167	0.510	0.252	0.120
image70	91.260	92.151	0.011	0.011	0.011	0.005
image71	39.208	52.274	0.248	0.521	0.336	0.243
image72	75.511	82.195	0.077	0.126	0.096	0.058
image73	9.182	12.317	0.205	0.682	0.315	0.148
image74	12.348	15.747	0.188	0.603	0.286	0.139
image75	22.753	23.633	0.030	0.037	0.033	0.032

TABLE VII
QUANTITATIVE RESULTS OF TopNet ON EACH IMAGE

	SD	SSD	PRECISION	RECALL	F1	MES
image1	10.586	15.805	0.374	0.338	0.355	0.212
image2	16.389	21.165	0.241	0.237	0.239	0.170
image3	11.129	12.040	0.081	0.082	0.081	0.067
image4	8.860	10.557	0.215	0.200	0.207	0.119
image5	11.819	13.580	0.158	0.152	0.155	0.095
image6	18.084	29.306	0.405	0.371	0.387	0.254
image7	20.356	37.540	0.480	0.425	0.451	0.285
image8	28.920	54.670	0.496	0.408	0.448	0.241
image9	36.318	74.017	0.521	0.459	0.488	0.319
image10	4.455	7.254	0.720	0.504	0.593	0.273
image11	3.014	5.856	0.717	0.544	0.618	0.361
image12	3.400	6.781	0.686	0.538	0.603	0.366
image13	5.657	14.060	0.688	0.542	0.606	0.371
image14	8.531	14.272	0.472	0.403	0.435	-
image15	6.967	15.843	0.682	0.485	0.567	0.256
image16	5.102	10.268	0.672	0.520	0.586	0.324
image17	5.175	14.279	0.730	0.567	0.638	0.395
image18	2.165	3.458	0.802	0.564	0.662	0.363
image19	1.847	3.240	0.863	0.662	0.749	0.519
image20	2.258	3.472	0.805	0.564	0.663	0.359
image21	1.462	2.856	0.939	0.764	0.842	0.672
image22	1.627	3.061	0.901	0.693	0.784	0.575
image23	2.125	5.833	0.818	0.722	0.767	0.598
image24	1.647	2.753	0.877	0.692	0.774	0.569
image25	2.329	3.420	0.621	0.518	0.565	0.350
image26	2.055	3.932	0.813	0.642	0.717	0.499
image27	1.984	4.442	0.868	0.666	0.753	0.530
image28	1.888	3.380	0.900	0.658	0.760	0.512
image29	1.991	3.187	0.793	0.603	0.685	0.444
image30	1.844	4.296	0.874	0.696	0.775	0.575
image31	1.793	3.041	0.829	0.670	0.741	0.524
image32	2.333	3.702	0.809	0.572	0.670	0.376
image33	1.611	2.841	0.893	0.684	0.775	0.554
image34	1.884	2.838	0.819	0.621	0.707	0.464
image35	1.664	2.917	0.876	0.667	0.757	0.525
image36	1.847	2.752	0.776	0.612	0.685	0.455
image37	1.891	2.887	0.789	0.599	0.681	0.436
image38	1.741	2.790	0.794	0.697	0.742	0.557
image39	1.838	3.214	0.885	0.635	0.740	0.472
image40	1.792	3.335	0.871	0.665	0.754	0.529

image41	2.007	3.015	0.787	0.605	0.684	0.446
image42	1.760	2.830	0.848	0.642	0.730	0.486
image43	2.231	3.345	0.748	0.550	0.634	0.356
image44	2.415	3.478	0.652	0.492	0.561	0.303
image45	1.547	2.843	0.860	0.729	0.789	0.616
image46	2.017	3.647	0.906	0.652	0.758	0.496
image47	1.930	3.273	0.847	0.663	0.744	0.528
image48	1.756	3.120	0.844	0.659	0.740	0.518
image49	1.701	2.883	0.837	0.706	0.766	0.568
image50	2.113	3.542	0.813	0.579	0.676	0.379
image51	2.304	3.251	0.714	0.528	0.607	0.334
image52	1.738	3.547	0.905	0.650	0.757	0.501
image53	-	-	-	-	-	-
image54	1.767	3.709	0.869	0.647	0.742	0.505
image55	1.550	3.990	0.973	0.696	0.811	0.569
image56	1.721	3.384	0.858	0.647	0.738	0.510
image57	1.914	4.509	0.944	0.661	0.777	0.505
image58	1.782	3.643	0.920	0.647	0.760	0.489
image59	1.476	3.495	0.959	0.692	0.804	0.567
image60	2.005	4.084	0.832	0.604	0.700	0.436
image61	1.718	3.754	0.917	0.651	0.761	0.498
image62	1.651	3.287	0.905	0.667	0.768	0.534
image63	2.274	3.970	0.739	0.548	0.629	0.371
image64	1.757	3.593	0.904	0.648	0.754	0.497
image65	1.653	3.680	0.914	0.645	0.756	0.487
image66	2.234	3.826	0.756	0.560	0.643	0.388
image67	2.277	3.838	0.730	0.548	0.626	0.377
image68	57.916	62.143	0.063	0.086	0.073	0.097
image69	15.284	32.596	0.542	0.719	0.618	0.350
image70	15.138	36.587	0.611	0.575	0.592	0.410
image71	9.990	22.904	0.578	0.814	0.676	0.437
image72	70.209	74.777	0.057	0.072	0.064	0.068
image73	18.527	26.303	0.294	0.434	0.351	0.221
image74	13.454	19.183	0.304	0.390	0.342	0.210
image75	25.844	52.497	0.514	0.608	0.557	0.339

TABLE VIII
QUANTITATIVE RESULTS OF OUR METHOD ON EACH IMAGE

	SD	SSD	PRECISION	RECALL	F1	MES
image1	5.3985	11.9854	0.7278	0.5552	0.6299	0.3599
image2	20.5419	44.5924	0.5654	0.4987	0.5300	0.3256
image3	16.9496	20.4026	0.7048	0.4495	0.5489	0.1300
image4	8.0115	12.4762	0.7275	0.5101	0.5997	0.2721
image5	6.2535	9.5992	0.7661	0.5266	0.6242	0.2862
image6	23.4590	57.3540	0.5959	0.7196	0.6520	0.4913
image7	21.4137	50.0436	0.5782	0.7431	0.6504	0.4957
image8	23.1375	82.7557	0.7301	0.7289	0.7295	0.5620
image9	51.9749	119.5103	0.5630	0.7478	0.6423	0.4777
image10	2.4190	8.5676	0.8448	0.7964	0.8199	0.6762
image11	3.0077	12.6319	0.8399	0.8029	0.8210	0.6798
image12	3.4559	17.1388	0.8561	0.8154	0.8353	0.6992
image13	14.0454	47.9196	0.7182	0.8089	0.7609	0.6064
image14	4.6659	18.2083	0.7870	0.8192	0.8028	0.6663
image15	9.7469	42.7137	0.8024	0.7135	0.7553	0.5750
image16	5.1371	17.0542	0.7464	0.7367	0.7415	0.5739
image17	8.8096	34.4316	0.7634	0.8091	0.7856	0.6391
image18	1.9276	3.6764	0.8879	0.6907	0.7770	0.5567
image19	1.7539	3.4762	0.9012	0.7646	0.8273	0.6605
image20	1.8298	3.2266	0.9066	0.7487	0.8202	0.6377
image21	1.4623	3.1685	0.9679	0.8306	0.8940	0.7780
image22	1.6347	2.8628	0.9297	0.7192	0.8110	0.6047
image23	2.1544	7.0119	0.8527	0.7695	0.8090	0.6479
image24	1.6543	3.0805	0.9318	0.7488	0.8304	0.6532
image25	2.1923	3.2313	0.7782	0.6200	0.6901	0.4509
image26	2.0128	4.6528	0.8669	0.7294	0.7922	0.6078
image27	2.0603	6.3870	0.8783	0.7934	0.8337	0.6879
image28	1.7246	3.5961	0.8896	0.7863	0.8348	0.6822
image29	1.7439	2.8249	0.8510	0.7479	0.7961	0.6182
image30	1.6775	4.6904	0.9136	0.8322	0.8710	0.7455
image31	1.6264	2.8378	0.8302	0.7707	0.7993	0.6273
image32	2.1002	4.0352	0.8591	0.7205	0.7837	0.5926
image33	1.5479	3.0415	0.9474	0.7574	0.8418	0.6671
image34	1.6067	2.9262	0.9114	0.7808	0.8411	0.6836
image35	1.6481	3.1574	0.9381	0.7738	0.8480	0.6859
image36	1.6981	2.7067	0.8490	0.7360	0.7885	0.6039
image37	1.6207	2.9806	0.8960	0.7572	0.8208	0.6489
image38	1.7187	2.9550	0.8887	0.8021	0.8432	0.6885
image39	1.8867	3.6799	0.8866	0.6819	0.7709	0.5458
image40	1.5922	4.0659	0.8891	0.8426	0.8652	0.7366

image41	1.9341	3.0531	0.8063	0.6797	0.7376	0.5257
image42	1.7689	2.8799	0.8063	0.7387	0.7710	0.5910
image43	2.1195	4.3471	0.8896	0.6973	0.7818	0.5626
image44	1.9107	2.9377	0.7793	0.6391	0.7023	0.4593
image45	1.5101	3.2726	0.8911	0.8234	0.8559	0.7227
image46	1.4695	3.5886	0.9623	0.8308	0.8918	0.7772
image47	1.6848	3.2974	0.8877	0.7911	0.8367	0.6847
image48	1.5058	3.4246	0.8985	0.8112	0.8526	0.7144
image49	1.6225	2.6203	0.8524	0.8006	0.8257	0.6653
image50	2.1317	3.9633	0.8174	0.6321	0.7129	0.4680
image51	1.9476	3.3224	0.8104	0.6796	0.7393	0.5282
image52	1.1571	3.5305	0.9429	0.8773	0.9089	0.8297
image53	0.9524	3.0151	0.9578	0.9178	0.9374	0.8829
image54	1.1915	3.7373	0.8978	0.8414	0.8687	0.7704
image55	0.9493	3.6399	0.9637	0.8663	0.9124	0.8298
image56	1.4098	3.9615	0.9234	0.7828	0.8473	0.7075
image57	1.2225	3.9331	0.9133	0.8283	0.8687	0.7630
image58	1.0163	3.8120	0.9745	0.8923	0.9316	0.8665
image59	0.8867	2.8624	0.9780	0.9140	0.9449	0.8933
image60	1.2966	3.9334	0.8937	0.8054	0.8473	0.7282
image61	1.0152	3.6076	0.9677	0.9085	0.9372	0.8800
image62	0.9510	2.6626	0.9676	0.9099	0.9379	0.8817
image63	1.7888	4.2192	0.8358	0.7106	0.7681	0.5977
image64	0.9553	3.0784	0.9736	0.9099	0.9407	0.8850
image65	1.3710	3.4242	0.9152	0.7935	0.8500	0.7149
image66	1.6021	4.6143	0.9424	0.7432	0.8310	0.6527
image67	1.8584	4.3791	0.9144	0.7102	0.7994	0.5982
image68	22.4687	43.4784	0.4891	0.6090	0.5425	0.3783
image69	7.4447	16.9017	0.5970	0.7076	0.6476	0.4671
image70	12.2383	53.4401	0.7891	0.7558	0.7721	0.6148
image71	3.4578	21.3501	0.8804	0.8673	0.8738	0.7655
image72	6.1045	9.5512	0.3816	0.4555	0.4153	0.2672
image73	4.1289	7.4459	0.5285	0.6091	0.5659	0.3666
image74	5.0989	8.5902	0.4642	0.5434	0.5007	0.3070
image75	8.9365	24.1489	0.6569	0.7638	0.7063	0.5288