

Anexos

1. Comparación de tejido denso utilizando los estimadores globales “intersección sobre unión”, “SSIM” y “normal L2” en 100 mamografías.
2. Porcentaje de tejido denso mamario calculado en las segmentaciones “C-medias difusas”, “bimodal”, “Bden”, “Otsu” y “propuesta de técnica”.
3. Selección de la mejor técnica de segmentación de las cinco técnicas implementadas en base a los tres estimador globales de “intersección sobre unión”, “SSIM” y “norma L2”.
4. Coeficiente de correlación de Pearson entre la segmentación manual del experto versus las técnicas implementadas en computadora.



Tema: Comparación de tejido denso utilizando estimadores globales en 100 mamografías.			
Descripción:	Se ha realizado la comparación de la segmentación manual del experto versus las segmentaciones implementadas de C-medias difusas, bimodal, Bden, Otsu y la técnica propuesta para la segmentación de tejido denso utilizando 3 estimadores globales.		

N° estimador	Nombre de estimadores globales	Abreviación	Rango
1	Interseccion sobre union	I/U	[0; 100] %
2	Indice de similitud estructural	SSIM	[-1; 1]
3	Norma L2	norma	> 0

Resultado 1 Segmentación manual del experto Vs. C-medias difusas				Resultado 2 Segmentación manual del experto Vs. bimodal			
Nro. Mamografía	I/U	SSIM	norma	Nro. Mamog.	I/U	SSIM	norma
1	0.6438	0.996697007	360	1	0.6463	0.99684847	371
2	0.7007	0.997414804	323	2	0.6750	0.99703266	354
3	0.2704	0.988231829	822	3	0.2464	0.98737367	867
4	0.4845	0.99550568	460	4	0.4777	0.99550898	460
5	0.3656	0.994928345	428	5	0.2364	0.99164493	652
6	0.4479	0.992016454	523	6	0.4488	0.99196736	525
7	0.7706	0.997598479	251	7	0.7179	0.9966005	331
8	0.6213	0.956612884	437	8	0.6309	0.99611244	446
9	0.4739	0.98977086	644	9	0.4741	0.98974526	644
10	0.3279	0.989938593	756	10	0.3356	0.98991662	761
11	0.7528	0.995628722	404	11	0.6460	0.99043414	679
12	0.3378	0.991045709	691	12	0.4405	0.99368674	547
13	0.5917	0.99795452	263	13	0.7369	0.99931105	216
14	0.5170	0.994005187	507	14	0.5215	0.99430189	481
15	0.4850	0.988547127	632	15	0.4603	0.98759653	677
16	0.4889	0.990209926	613	16	0.4714	0.98978199	617
17	0.4042	0.989376333	680	17	0.4082	0.98893387	698
18	0.4358	0.988704256	675	18	0.4418	0.98829931	699
19	0.4458	0.991208309	631	19	0.5216	0.99309891	523
20	0.6729	0.996842963	335	20	0.6336	0.99545326	438
21	0.6188	0.992421334	582	21	0.5937	0.99113212	643
22	0.3026	0.982556362	915	22	0.3909	0.98783594	639
23	0.4207	0.986489732	602	23	0.4122	0.98581335	623
24	0.4093	0.988218127	753	24	0.4268	0.98839133	738
25	0.4795	0.991548184	592	25	0.4906	0.99160262	590
26	0.6199	0.995860988	356	26	0.6469	0.99639472	314
27	0.1870	0.986434937	986	27	0.1897	0.9861809	999
28	0.3007	0.99072632	717	28	0.3066	0.99068627	718
29	0.3500	0.966137023	168	29	0.2000	0.96785062	163
30	0.5189	0.990663975	558	30	0.5185	0.99066038	558
31	0.4217	0.992038807	588	31	0.4260	0.99208294	585
32	0.2958	0.991607189	610	32	0.2984	0.99156766	610
33	0.5927	0.996465057	413	33	0.6526	0.99710204	331
34	0.4059	0.994666162	489	34	0.4238	0.99465484	476
35	0.5134	0.99511211	529	35	0.5223	0.99519848	522
36	0.7384	0.997193594	269	36	0.6828	0.99612829	379
37	0.1776	0.985004301	960	37	0.1773	0.98442825	980
38	0.1843	0.986655105	888	38	0.1988	0.98601682	912
39	0.5990	0.995933091	410	39	0.6011	0.99612239	386
40	0.4817	0.992762191	543	40	0.4738	0.9926599	544
41	0.6521	0.99497034	404	41	0.5770	0.99136634	661
42	0.3091	0.988769245	762	42	0.3258	0.98476796	863
43	0.5230	0.995836963	393	43	0.5439	0.99547133	438
44	0.1615	0.984253445	862	44	0.3697	0.98607588	935
45	0.4351	0.990153759	638	45	0.4301	0.98525814	865
46	0.1825	0.963401218	159	46	0.1547	0.93441442	254
47	0.6243	0.993155447	486	47	0.6179	0.99114557	669
48	0.5432	0.996033679	470	48	0.5002	0.99425546	571
49	0.4145	0.993355427	528	49	0.4775	0.99135955	671
50	0.5415	0.990984308	582	50	0.6203	0.98987231	708

51	0.3850	0.990263239	699	51	0.4400	0.98733108	926
52	0.3509	0.989563115	603	52	0.3300	0.98267039	112
53	0.4040	0.996151065	409	53	0.4024	0.99468071	529
54	0.6351	0.992998023	433	54	0.6537	0.98959633	858
55	0.1368	0.989436743	770	55	0.4660	0.99410117	549
56	0.3697	0.990195657	638	56	0.3934	0.98581957	783
57	0.3939	0.994316059	575	57	0.4025	0.99270164	718
58	0.3130	0.987662037	793	58	0.3558	0.98485664	103
59	0.7321	0.997786245	328	59	0.7089	0.99492795	628
60	0.2184	0.968598867	159	60	0.1497	0.95218842	206
61	0.4732	0.992614878	563	61	0.4945	0.98613829	993
62	0.5323	0.990397326	584	62	0.6364	0.9899338	666
63	0.4150	0.991431509	548	63	0.4090	0.98782765	719
64	0.4915	0.992513355	572	64	0.5687	0.99150031	620
65	0.3514	0.993452123	580	65	0.3833	0.99144929	647
66	0.1462	0.97995318	106	66	0.4506	0.98644221	861
67	0.4618	0.990853806	640	67	0.5023	0.98688585	892
68	0.3186	0.988240743	723	68	0.3788	0.98321427	986
69	0.1112	0.986428992	938	69	0.4760	0.99308802	687
70	0.3709	0.991334071	763	70	0.4391	0.99069061	817
71	0.1052	0.981634124	118	71	0.0709	0.96549514	190
72	0.6484	0.995085579	485	72	0.6856	0.99476878	446
73	0.3179	0.987716241	848	73	0.2434	0.97143871	158
74	0.3949	0.991709139	713	74	0.2423	0.97452141	151
75	0.5861	0.997197685	359	75	0.6256	0.99600553	473
76	0.6980	0.996848339	316	76	0.6700	0.99572934	436
77	0.6876	0.996264384	382	77	0.6963	0.99536169	471
78	0.4127	0.995838329	470	78	0.3511	0.99142495	829
79	0.1857	0.989016814	761	79	0.2220	0.98491065	933
80	0.4260	0.992749772	612	80	0.4127	0.98846543	898
81	0.6047	0.997751829	274	81	0.5667	0.99590882	530
82	0.1521	0.976804464	130	82	0.1813	0.97234891	152
83	0.3574	0.984108966	892	83	0.3221	0.97488166	125
84	0.4788	0.99053803	652	84	0.5109	0.98587874	933
85	0.5160	0.993435489	480	85	0.5700	0.99097341	748
86	0.4710	0.990733041	595	86	0.1865	0.97011245	133
87	0.4379	0.990409478	678	87	0.5368	0.98966988	713
88	0.4245	0.989000932	723	88	0.3788	0.98005369	108
89	0.4658	0.991559279	569	89	0.5417	0.98900524	776
90	0.4687	0.992786572	426	90	0.5225	0.98945491	750
91	0.3755	0.99215918	651	91	0.4365	0.98948892	870
92	0.4885	0.99255979	557	92	0.4010	0.98314684	119
93	0.4778	0.994429279	432	93	0.4592	0.99037718	766
94	0.5356	0.996099659	454	94	0.4755	0.98946716	970
95	0.2890	0.985362418	847	95	0.3303	0.97819761	114
96	0.3072	0.983840147	120	96	0.2429	0.96989778	168
97	0.5896	0.991881693	541	97	0.5897	0.98637148	976
98	0.4942	0.992492772	576	98	0.4713	0.98662818	987
99	0.3068	0.98688131	777	99	0.2696	0.97514492	143
100	0.4296	0.986473304	747	100	0.4338	0.9799651	114
Promedio C-medias	0.4399	0.9903	552.5512	Promedio bimodal	0.4511	0.9877	578.1333

Resultado 3 Segmentación manual del experto Vs. Bden				Resultado 3 Segmentación manual del experto Vs. Otsu			
Nro. Mamog	I/U	SSIM	norma	Nro. Mamog	I/U	SSIM	norma
1	0.7808	0.99831629	237	1	0.432	0.98811676	833
2	0.5774	0.99261085	790	2	0.363	0.98763649	782
3	0.2053	0.98111963	102	3	0.241	0.98471258	888
4	0.3320	0.98816811	987	4	0.336	0.98874025	957
5	0.2262	0.98768779	791	5	0.223	0.98150057	120
6	0.4320	0.98223409	126	6	0.417	0.98197641	124
7	0.5217	0.98283188	121	7	0.716	0.99483562	519
8	0.8671	0.99925067	180	8	0.618	0.99383812	554
9	0.6721	0.99137217	730	9	0.593	0.98903966	668
10	0.4181	0.98845583	851	10	0.303	0.98352164	106
11	0.6055	0.97374676	152	11	0.646	0.98103247	122
12	0.4125	0.98692056	996	12	0.380	0.98593869	102
13	0.3288	0.98596105	115	13	0.255	0.98532444	107
14	0.8139	0.99863203	245	14	0.397	0.98909116	824
15	0.7932	0.99746285	289	15	0.534	0.98323231	975
16	0.3199	0.97206543	137	16	0.552	0.98833481	799
17	0.3291	0.97029865	158	17	0.339	0.9744592	139
18	0.2769	0.96677399	159	18	0.386	0.98221306	941
19	0.6207	0.99459573	458	19	0.246	0.97944468	109
20	0.5124	0.98177079	128	20	0.512	0.98219024	126
21	0.6830	0.99128966	613	21	0.537	0.97648238	139
22	0.4457	0.99080284	627	22	0.357	0.9727644	139
23	0.5584	0.98270567	105	23	0.537	0.98626809	699
24	0.7857	0.99775184	280	24	0.518	0.9859233	890
25	0.4990	0.98581427	100	25	0.386	0.98439864	962
26	0.4936	0.98261825	119	26	0.482	0.98469875	102
27	0.5039	0.99287696	619	27	0.178	0.98327714	108
28	0.4826	0.99170581	793	28	0.237	0.98474348	105
29	0.3620	0.99057538	787	29	0.340	0.94999145	221
30	0.6568	0.99491947	426	30	0.469	0.9772467	139
31	0.4314	0.99346203	630	31	0.324	0.98289958	102
32	0.4180	0.9957666	457	32	0.230	0.98247611	106
33	0.8337	0.99900276	225	33	0.278	0.98694703	923
34	0.4407	0.99337468	590	34	0.154	0.9854979	105
35	0.5743	0.99509033	488	35	0.601	0.99522974	487
36	0.7783	0.99735315	311	36	0.732	0.99550936	445
37	0.6172	0.99558819	501	37	0.159	0.97917693	115
38	0.7693	0.9983609	269	38	0.192	0.98334849	100
39	0.7286	0.99784121	264	39	0.581	0.99446012	547
40	0.2536	0.98900584	964	40	0.579	0.99137246	680
41	0.8006	0.99773543	326	41	0.389	0.98420663	956
42	0.4633	0.99127464	634	42	0.255	0.98144326	969
43	0.6730	0.99765474	362	43	0.173	0.9847384	111
44	0.4620	0.99111262	645	44	0.175	0.97665327	119
45	0.5077	0.98862915	746	45	0.436	0.98598498	819
46	0.1632	0.92693716	272	46	0.170	0.95025509	205
47	0.7107	0.99518296	460	47	0.644	0.99268056	533
48	0.6538	0.99749659	324	48	0.241	0.98811091	910
49	0.5605	0.99611079	387	49	0.231	0.97992384	113
50	0.5173	0.99075867	795	50	0.618	0.98777827	876

51	0.4876	0.99184132	638	51	0.433	0.98558335	104
52	0.4294	0.99071325	658	52	0.319	0.97857166	137
53	0.4883	0.9965887	379	53	0.172	0.9896403	751
54	0.3198	0.97938028	895	54	0.391	0.97508123	136
55	0.5626	0.99757241	364	55	0.171	0.98172232	108
56	0.5393	0.99350662	437	56	0.383	0.98381426	933
57	0.4322	0.99327737	686	57	0.154	0.98648222	108
58	0.4571	0.99120685	645	58	0.273	0.97880159	126
59	0.6962	0.99678321	391	59	0.640	0.99126166	877
60	0.1568	0.97412805	121	60	0.205	0.92899339	264
61	0.4831	0.99279547	602	61	0.445	0.97955779	125
62	0.3980	0.98668196	982	62	0.598	0.98440708	103
63	0.5381	0.99282739	477	63	0.433	0.9898088	584
64	0.6190	0.9956365	433	64	0.545	0.98852502	785
65	0.5806	0.99719728	400	65	0.179	0.98149685	116
66	0.6746	0.99671607	375	66	0.188	0.97006127	138
67	0.6032	0.99183634	632	67	0.296	0.97648572	122
68	0.4828	0.99233196	521	68	0.363	0.97739178	132
69	0.5568	0.99538843	524	69	0.127	0.98222416	108
70	0.5638	0.99457187	591	70	0.294	0.98587514	100
71	0.1132	0.98475428	102	71	0.069	0.96266447	200
72	0.8192	0.99832025	255	72	0.685	0.99470891	451
73	0.3499	0.98631412	970	73	0.201	0.95680181	209
74	0.4123	0.99133973	749	74	0.223	0.96572087	188
75	0.6933	0.99828449	209	75	0.580	0.99427306	588
76	0.8433	0.99889817	189	76	0.463	0.98986101	739
77	0.6274	0.99442525	452	77	0.694	0.99524331	492
78	0.4991	0.99679675	430	78	0.116	0.98156106	123
79	0.3354	0.99129781	690	79	0.211	0.98306727	101
80	0.3454	0.99384608	510	80	0.343	0.98135692	122
81	0.7516	0.99916908	169	81	0.503	0.99383994	698
82	0.1761	0.97315381	147	82	0.102	0.96729591	155
83	0.3632	0.9785661	114	83	0.310	0.97522305	123
84	0.6571	0.99267213	650	84	0.513	0.98605688	923
85	0.6325	0.99300101	674	85	0.390	0.98397913	926
86	0.5204	0.9892997	751	86	0.281	0.97809479	110
87	0.6738	0.99529905	355	87	0.534	0.98938933	736
88	0.5013	0.98883848	723	88	0.367	0.97820989	116
89	0.4766	0.99120858	579	89	0.501	0.98472977	106
90	0.1761	0.98505921	851	90	0.425	0.98051734	118
91	0.4902	0.99545281	452	91	0.425	0.98706455	103
92	0.5925	0.99639797	342	92	0.399	0.98160401	128
93	0.5776	0.99494159	445	93	0.249	0.98209389	103
94	0.7171	0.9981768	291	94	0.396	0.98259606	131
95	0.4193	0.98816357	724	95	0.284	0.97090675	142
96	0.3108	0.98434835	115	96	0.188	0.95219296	218
97	0.6415	0.99348324	423	97	0.548	0.98143869	123
98	0.5511	0.99357481	542	98	0.283	0.97568592	133
99	0.4107	0.99306436	521	99	0.225	0.96852979	163
100	0.4553	0.99106946	603	100	0.388	0.96968322	164
Promedio Bden	0.5208	0.9904	466.4566	Promedio Otsu	0.372	0.981	370.102

Resultado 4		Segmentación manual del experto Vs. técnica propuesta	
Nro. Mamografía	tu tecnica prop	ssim propue	norma de propuesta
1	0.6941	0.99736092	375
2	0.7897	0.99822364	318
3	0.7932	0.9984	327
4	0.7569	0.99893499	241
5	0.5705	0.99735397	305
6	0.6535	0.99626132	458
7	0.8018	0.99746641	294
8	0.8560	0.999254	162
9	0.8002	0.99820477	226
10	0.7616	0.998	347
11	0.6874	0.99162286	571
12	0.7133	0.9978	354
13	0.6308	0.9966	527
14	0.7739	0.99822498	285
15	0.7700	0.99722955	279
16	0.8479	0.99899229	156
17	0.7981	0.9987	197
18	0.7624	0.9969	391
19	0.8063	0.99853731	219
20	0.6921	0.99648697	382
21	0.4903	0.98739965	805
22	0.5049	0.9889	591
23	0.7567	0.99682377	311
24	0.8083	0.99813274	282
25	0.8224	0.9983	296
26	0.7248	0.996	437
27	0.7792	0.99873039	213
28	0.8317	0.99911666	202
29	0.5667	0.9934	529
30	0.7689	0.99724627	377
31	0.7382	0.9977	253
32	0.5232	0.9947	569
33	0.8075	0.99863591	250
34	0.7553	0.9986	297
35	0.8095	0.99884451	242
36	0.7688	0.99659213	353
37	0.8367	0.99910164	233
38	0.7539	0.99818772	275
39	0.7734	0.99835639	234
40	0.6440	0.9962	434
41	0.7892	0.99750016	337
42	0.5303	0.99290122	579
43	0.7318	0.99811784	334
44	0.8125	0.99906843	177
45	0.5869	0.9931465	507
46	0.7425	0.99296978	500
47	0.7543	0.99614771	397
48	0.6676	0.99711523	404
49	0.7631	0.99868016	209
50	0.6577	0.9945093	566

51	0.7573	0.998	298
52	0.4707	0.9909	766
53	0.7531	0.9991	210
54	0.4571	0.9868	999
55	0.7261	0.99906492	194
56	0.7417	0.99729784	385
57	0.5577	0.99618364	482
58	0.6157	0.9948084	498
59	0.6952	0.99646165	361
60	0.1209	0.97192878	118
61	0.5200	0.9938	613
62	0.5660	0.99192907	672
63	0.5444	0.99250583	513
64	0.7900	0.99860293	210
65	0.4905	0.99444526	467
66	0.6662	0.99631027	391
67	0.8341	0.99900289	170
68	0.5932	0.99469752	494
69	0.6828	0.99796743	326
70	0.7441	0.99772497	355
71	0.0971	0.98224804	111
72	0.8209	0.99852585	199
73	0.3399	0.98390198	114
74	0.4169	0.98929191	938
75	0.7643	0.99898169	172
76	0.7490	0.99724698	306
77	0.6517	0.99476066	429
78	0.5284	0.9959	574
79	0.7449	0.9982	314
80	0.3956	0.99	872
81	0.5865	0.99646414	419
82	0.5405	0.9911	671
83	0.6820	0.9938	949
84	0.7177	0.99478634	593
85	0.7994	0.99861645	225
86	0.5567	0.98992593	788
87	0.7965	0.99804428	263
88	0.5810	0.99093908	743
89	0.6692	0.99495425	571
90	0.5440	0.99405979	456
91	0.6612	0.99674739	521
92	0.6115	0.99563904	411
93	0.7927	0.99900948	195
94	0.7000	0.99774438	348
95	0.6300	0.98993949	719
96	0.2972	0.98013962	134
97	0.6746	0.9940793	500
98	0.6184	0.9952568	499
99	0.4634	0.9938	682
100	0.6050	0.99308	587
Promedio técnica	0.6682	0.9954	404.3302

N° Anexo

2

Tema Porcentaje de tejido denso mamario calculado en 5 segmentaciones

Descripcion: Se calcula el porcentaje de tejido denso mamario en la segmentación manual del experto, C-medias difusas, bimodal, Bden, Otsu y la técnica propuesta.

Resultado 1		Resultado 2		Resultado 3	
Segmentación manual del experto		Segmentación C-medias difusas		Segmentación bimodal	
Numero	% tejido denso	Numero	% tejido denso	Numero	% tejido denso
1	51.52%	1	48.69%	1	44.80%
2	43.70%	2	43.87%	2	40.40%
3	41.17%	3	40.83%	3	41.21%
4	41.86%	4	40.64%	4	39.05%
5	25.66%	5	26.46%	5	31.97%
6	34.34%	6	37.93%	6	36.67%
7	39.39%	7	39.48%	7	35.06%
8	51.18%	8	48.02%	8	43.64%
9	46.84%	9	37.34%	9	36.02%
10	36.60%	10	37.02%	10	37.52%
11	46.92%	11	45.05%	11	36.31%
12	33.36%	12	39.33%	12	37.50%
13	26.51%	13	25.78%	13	28.28%
14	53.12%	14	48.33%	14	45.26%
15	42.75%	15	39.15%	15	35.97%
16	44.75%	16	41.20%	16	37.99%
17	34.43%	17	30.70%	17	31.76%
18	37.53%	18	35.03%	18	37.66%
19	44.88%	19	42.82%	19	43.99%
20	36.12%	20	37.70%	20	31.69%
21	46.46%	21	45.39%	21	40.46%
22	43.41%	22	46.57%	22	39.26%
23	47.19%	23	34.49%	23	33.10%
24	48.30%	24	35.73%	24	38.28%
25	50.11%	25	41.27%	25	42.88%
26	42.21%	26	31.67%	26	34.19%
27	51.80%	27	42.85%	27	45.10%
28	48.85%	28	40.18%	28	41.47%
29	50.05%	29	47.76%	29	43.82%
30	40.13%	30	36.74%	30	36.67%
31	53.80%	31	41.18%	31	41.75%
32	32.25%	32	41.18%	32	41.75%
33	63.67%	33	42.50%	33	49.93%
34	42.35%	34	35.21%	34	40.08%
35	49.85%	35	36.69%	35	37.84%
36	50.25%	36	43.71%	36	38.33%
37	43.20%	37	38.39%	37	41.43%
38	53.66%	38	42.39%	38	48.80%
39	52.69%	39	45.01%	39	42.81%
40	53.84%	40	43.39%	40	42.40%
41	62.36%	41	49.71%	41	67.36%
42	52.16%	42	34.89%	42	67.44%
43	55.16%	43	41.31%	43	60.20%
44	46.13%	44	35.11%	44	70.09%
45	49.00%	45	39.41%	45	67.75%
46	44.00%	46	32.89%	46	77.30%
47	58.54%	47	44.97%	47	69.99%
48	43.09%	48	35.82%	48	57.29%
49	47.08%	49	36.50%	49	70.25%
50	55.96%	50	42.43%	50	69.64%

51	44.75%	51	41.26%	51	70.62%
52	32.31%	52	38.21%	52	66.59%
53	41.32%	53	31.44%	53	57.88%
54	48.58%	54	37.56%	54	61.62%
55	43.97%	55	29.43%	55	63.72%
56	37.76%	56	26.18%	56	56.80%
57	46.30%	57	39.97%	57	69.63%
58	46.47%	58	33.83%	58	61.24%
59	50.06%	59	41.47%	59	69.25%
60	27.45%	60	63.69%	60	72.66%
61	40.99%	61	37.04%	61	74.60%
62	55.59%	62	43.65%	62	70.51%
63	25.18%	63	24.76%	63	48.20%
64	46.52%	64	35.78%	64	64.05%
65	40.90%	65	32.38%	65	56.20%
66	45.81%	66	35.94%	66	70.50%
67	49.25%	67	37.62%	67	68.73%
68	37.68%	68	30.79%	68	68.43%
69	54.23%	69	39.91%	69	70.01%
70	50.09%	70	38.98%	70	63.40%
71	6.22%	71	45.52%	71	76.28%
72	55.66%	72	38.14%	72	62.26%
73	18.08%	73	33.79%	73	66.51%
74	21.55%	74	34.67%	74	70.10%
75	44.69%	75	30.54%	75	64.65%
76	54.05%	76	45.11%	76	60.82%
77	56.54%	77	44.83%	77	62.20%
78	25.66%	78	32.82%	78	60.95%
79	35.95%	79	28.15%	79	59.14%
80	27.68%	80	38.26%	80	57.70%
81	38.41%	81	30.92%	81	58.88%
82	73.98%	82	42.26%	82	69.76%
83	40.47%	83	34.25%	83	61.46%
84	48.47%	84	31.29%	84	62.55%
85	54.04%	85	38.89%	85	72.35%
86	37.27%	86	29.49%	86	57.91%
87	45.11%	87	33.61%	87	63.79%
88	31.63%	88	31.45%	88	57.26%
89	38.40%	89	34.28%	89	63.47%
90	42.10%	90	37.56%	90	63.34%
91	38.15%	91	37.63%	91	66.07%
92	38.87%	92	46.06%	92	76.54%
93	46.25%	93	35.22%	93	68.21%
94	33.21%	94	20.04%	94	68.03%
95	35.73%	95	32.25%	95	64.67%
96	15.07%	96	36.74%	96	60.73%
97	45.63%	97	45.90%	97	73.68%
98	47.55%	98	45.12%	98	79.28%
99	24.20%	99	42.97%	99	73.37%
100	34.99%	100	42.84%	100	62.86%
Promedio	43.11%	Promedio	38.31%	Promedio	55.20%

Resultado 4		Resultado 5		Resultado 6	
Segmentacion de Bden		Segmentacion de Otsu		Técnica propuesta	
Numero	% tejido denso	Numero	% tejido denso	Numero	% tejido den
1	67.44%	1	74.46%	1	42.36%
2	77.19%	2	60.61%	2	56.00%
3	72.20%	3	59.48%	3	52.79%
4	72.74%	4	71.00%	4	48.98%
5	53.38%	5	85.83%	5	35.06%
6	83.40%	6	83.27%	6	39.42%
7	85.38%	7	61.35%	7	49.98%
8	59.08%	8	67.72%	8	53.69%
9	77.11%	9	72.89%	9	46.47%
10	63.25%	10	68.85%	10	52.18%
11	87.63%	11	81.91%	11	39.04%
12	76.95%	12	76.41%	12	43.47%
13	77.31%	13	68.66%	13	46.18%
14	55.34%	14	66.68%	14	49.36%
15	49.79%	15	76.18%	15	43.63%
16	77.99%	16	67.20%	16	49.79%
17	87.20%	17	80.26%	17	37.97%
18	89.63%	18	57.28%	18	50.08%
19	53.76%	19	64.30%	19	52.29%
20	80.30%	20	80.35%	20	38.98%
21	55.43%	21	86.44%	21	30.83%
22	31.27%	22	85.29%	22	32.66%
23	78.61%	23	61.60%	23	51.03%
24	49.53%	24	74.07%	24	47.41%
25	84.63%	25	61.90%	25	55.67%
26	84.55%	26	73.36%	26	49.51%
27	70.96%	27	63.74%	27	50.64%
28	72.52%	28	67.73%	28	49.94%
29	21.05%	29	82.89%	29	41.63%
30	32.64%	30	80.67%	30	40.96%
31	24.72%	31	73.80%	31	47.27%
32	24.72%	32	73.80%	32	47.27%
33	57.82%	33	70.03%	33	54.92%
34	60.81%	34	61.20%	34	49.99%
35	52.81%	35	60.87%	35	53.54%
36	49.95%	36	62.97%	36	55.05%
37	56.96%	37	66.79%	37	45.71%
38	53.14%	38	64.06%	38	50.63%
39	48.33%	39	64.44%	39	52.12%
40	14.53%	40	74.31%	40	44.25%
41	57.14%	41	68.00%	41	54.46%
42	47.38%	42	69.87%	42	48.86%
43	40.61%	43	68.72%	43	51.02%
44	54.96%	44	72.04%	44	45.35%
45	66.01%	45	65.05%	45	51.36%
46	88.61%	46	55.42%	46	52.44%
47	47.74%	47	62.74%	47	53.06%
48	32.82%	48	53.78%	48	51.65%
49	35.76%	49	80.22%	49	41.01%
50	30.22%	50	78.43%	50	40.18%

51	46.86%	51	78.55%	51	45.47%
52	39.34%	52	79.07%	52	44.76%
53	42.53%	53	59.14%	53	43.89%
54	23.68%	54	47.31%	54	46.99%
55	28.03%	55	83.72%	55	37.92%
56	35.86%	56	66.16%	56	46.36%
57	68.64%	57	65.50%	57	50.43%
58	39.20%	58	71.72%	58	45.74%
59	38.10%	59	77.63%	59	46.58%
60	31.74%	60	31.20%	60	31.80%
61	29.05%	61	86.32%	61	32.74%
62	23.05%	62	82.96%	62	34.25%
63	34.89%	63	40.80%	63	39.54%
64	33.79%	64	76.38%	64	41.63%
65	24.50%	65	73.60%	65	48.09%
66	43.50%	66	78.35%	66	44.64%
67	61.19%	67	67.74%	67	48.32%
68	32.89%	68	82.18%	68	40.80%
69	57.80%	69	70.37%	69	48.45%
70	49.13%	70	65.12%	70	52.21%
71	35.96%	71	81.09%	71	40.04%
72	46.72%	72	62.63%	72	51.39%
73	36.45%	73	86.27%	73	41.35%
74	32.81%	74	85.20%	74	39.67%
75	40.29%	75	71.93%	75	42.33%
76	47.96%	76	34.63%	76	54.16%
77	49.80%	77	63.53%	77	51.89%
78	31.68%	78	73.53%	78	41.58%
79	37.53%	79	66.20%	79	45.47%
80	17.18%	80	79.15%	80	47.36%
81	34.87%	81	68.40%	81	48.62%
82	63.68%	82	67.04%	82	52.92%
83	54.94%	83	57.06%	83	50.84%
84	54.27%	84	61.99%	84	53.47%
85	72.00%	85	67.80%	85	47.14%
86	48.77%	86	51.70%	86	52.84%
87	47.96%	87	65.35%	87	48.62%
88	31.94%	88	61.21%	88	45.54%
89	34.63%	89	74.35%	89	47.13%
90	15.67%	90	82.29%	90	33.88%
91	26.44%	91	76.50%	91	45.60%
92	30.12%	92	81.89%	92	38.52%
93	52.98%	93	69.81%	93	46.09%
94	30.67%	94	83.35%	94	34.94%
95	38.78%	95	77.34%	95	44.50%
96	31.81%	96	80.10%	96	40.65%
97	41.95%	97	82.10%	97	43.32%
98	43.47%	98	84.61%	98	42.40%
99	27.76%	99	81.78%	99	39.78%
100	20.40%	100	81.26%	100	38.35%
Promedio	49.37%	Promedio	70.53%	Promedio	45.89%

N° Anexo 3

Tema Selección de la mejor técnica de segmentación en base al estimador global.

Descripción Definir qué técnica de segmentación es mejor en base al estimador global.
Se utilizan 3 estimadores globales: I/U, SSIM y NORM L2 para evaluar los resultados del anexo n° 1.

Se utiliza la siguiente notación para indicar a que resultado corresponden las comparaciones:

Técnicas de segmentación	Número indicador
Propuesta de segmentación	1
Bden	2
C-means	3
Bimodal	4
Otsu	5

Nro. Comparación	I/U	SSIM	norma
1	2	2	5
2	1	1	2
3	1	1	5
4	1	1	2
5	1	1	2
6	1	1	4
7	1	3	5
8	2	1	5
9	1	1	2
10	1	1	2
11	3	3	4
12	1	1	2
13	4	4	1
14	2	2	5
15	2	2	5
16	1	1	5
17	1	1	4
18	1	1	5
19	1	1	3
20	1	3	4
21	2	3	1
22	1	1	3
23	1	1	5
24	1	1	5
25	1	1	5
26	1	4	1
27	1	1	4
28	1	1	2
29	1	1	2
30	1	1	3
31	1	1	2

32	1	2	3
33	2	2	5
34	1	1	2
35	1	1	3
36	2	2	5
37	1	1	4
38	2	2	4
39	1	1	5
40	1	1	2
41	2	2	5
42	1	1	5
43	1	1	4
44	1	1	4
45	1	1	4
46	1	1	1
47	1	1	4
48	1	2	5
49	1	1	4
50	1	1	5
51	1	1	4
52	1	2	1
53	1	1	5
54	4	3	1
55	1	1	3
56	1	1	5
57	1	1	4
58	1	1	3
59	3	3	5
60	3	2	5
61	1	2	4
62	4	1	2
63	1	2	4
64	1	1	5
65	2	2	4
66	1	2	4
67	1	1	4
68	1	1	4
69	1	1	3
70	1	1	4
71	2	2	5
72	1	1	3
73	2	3	2
74	1	3	1
75	1	1	5
76	2	2	5
77	4	3	5
78	2	2	4
79	1	1	4
80	3	2	4
81	2	2	5

82	2	3	5
83	1	1	1
84	1	1	4
85	1	1	5
86	1	3	1
87	1	1	5
88	1	1	1
89	1	1	4
90	1	1	2
91	1	1	4
92	1	2	3
93	1	1	4
94	2	2	4
95	1	1	3
96	2	2	5
97	1	1	4
98	1	1	4
99	1	2	3
100	1	1	3

N° Anexo	4
Tema	Grado de Correlación de Pearson entre la segmentación manual del experto Vs. las implementadas
Descripción:	Se calcula el grado o índice de correlación de Pearson de las segmentaciones de C-medias difusas, bimodal, Bden, Otsu y la técnica propuesta con respecto a la segmentación manual del experto.

ENTRADAS					
Comparación	Segmentación 1	Segmentación 2	Índice de Pearson	Intervalo	Intensidad de Correlación
1	Manual	Bden	0.1840	-0.5<P<0.2	Pobre correlación
2	Manual	Fuzzy C means	0.3437	0.75<P<1	Pobre correlación
3	Manual	Bimodal	0.0176	P<0.25	No hay correlación
4	Manual	Otsu	-0.1954	P<0.25	Pobre correlación
5	Manual	Técnica Propuesta	0.4581	0.450<P<0.75	Moderada correlación

N° Anexo	5		
Tema:	Relación entre la función norma y la segmentación de Otsu		
Descripción:	Durante el proceso de segmentación de Otsu,este utiliza como indicador principal a la varianza estadística de las 100 mamografía. También se ha calculado el valor del estimador global norma de cada una de las mamografías. Las mamografías se encuentran en escala de grises y han sido pre-procesadas (en este caso normalizadas). Se ha establecido la relación entre la varianza		
N°	Nombre	Abreviación	Rango
1	Norma L2	norma	> 0
2	Varianza estadística de mamografías	varianza	> 0

Mamografía N°	1	
% de varianza máxima	Varianza Máxima	Norma
100	1021.60	699.00
95	1000.29	453.80
90	931.51	431.05
85	822.68	484.24
80	651.98	626.29
75	452.71	808.48
70	269.67	962.67
65	138.42	1058.76
60	62.77	1106.28
55	21.14	1128.24
50	5.74	1134.86

