

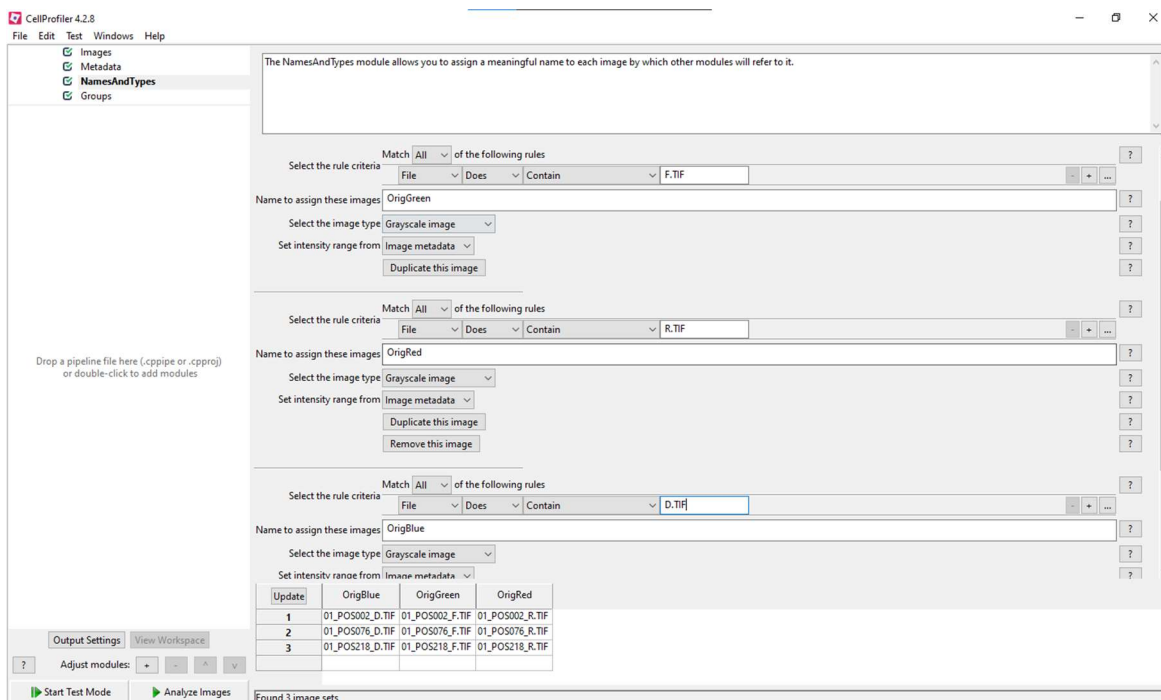
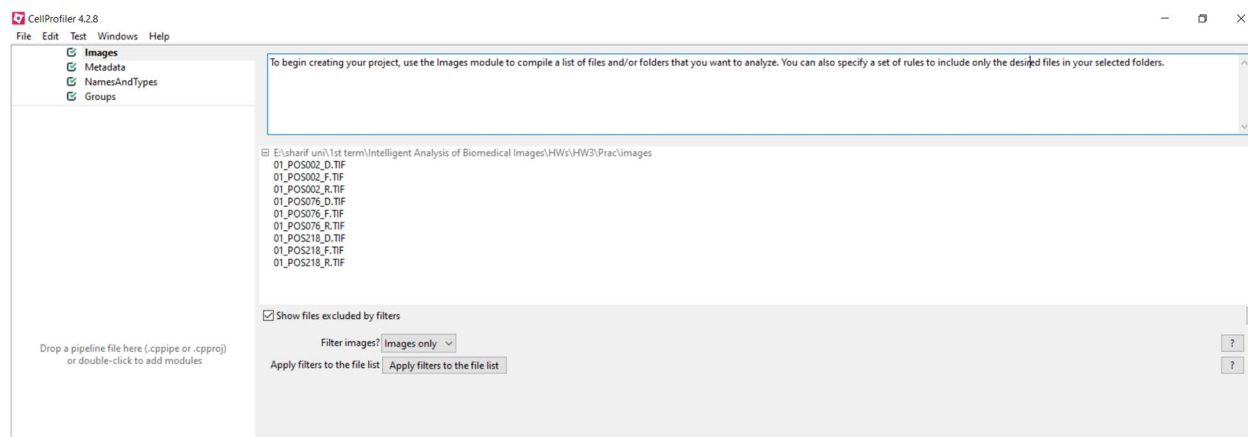
به نام خدا

گزارش تمرین عملی سری سوم
درس تحلیل هوشمند تصاویر زیست پزشکی
دکتر محمد حسین رهبان

فرزان رحمانی
۴۰۳۲۱۰۷۲۵

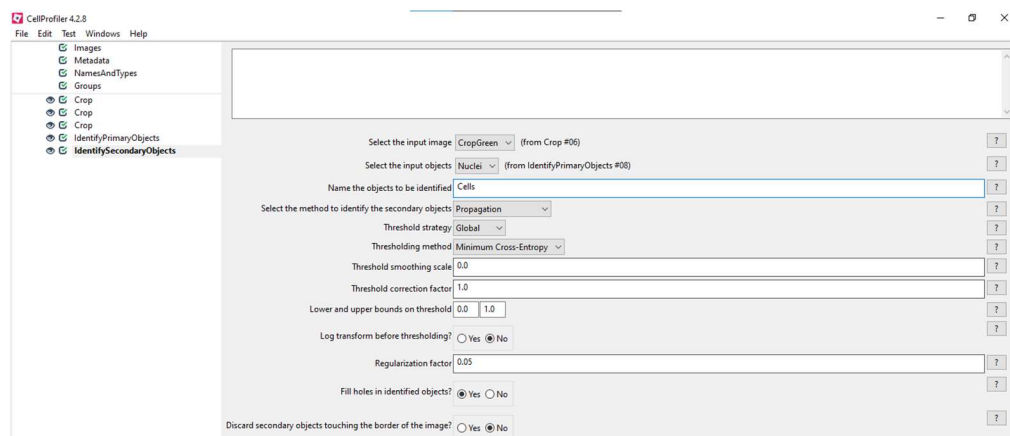
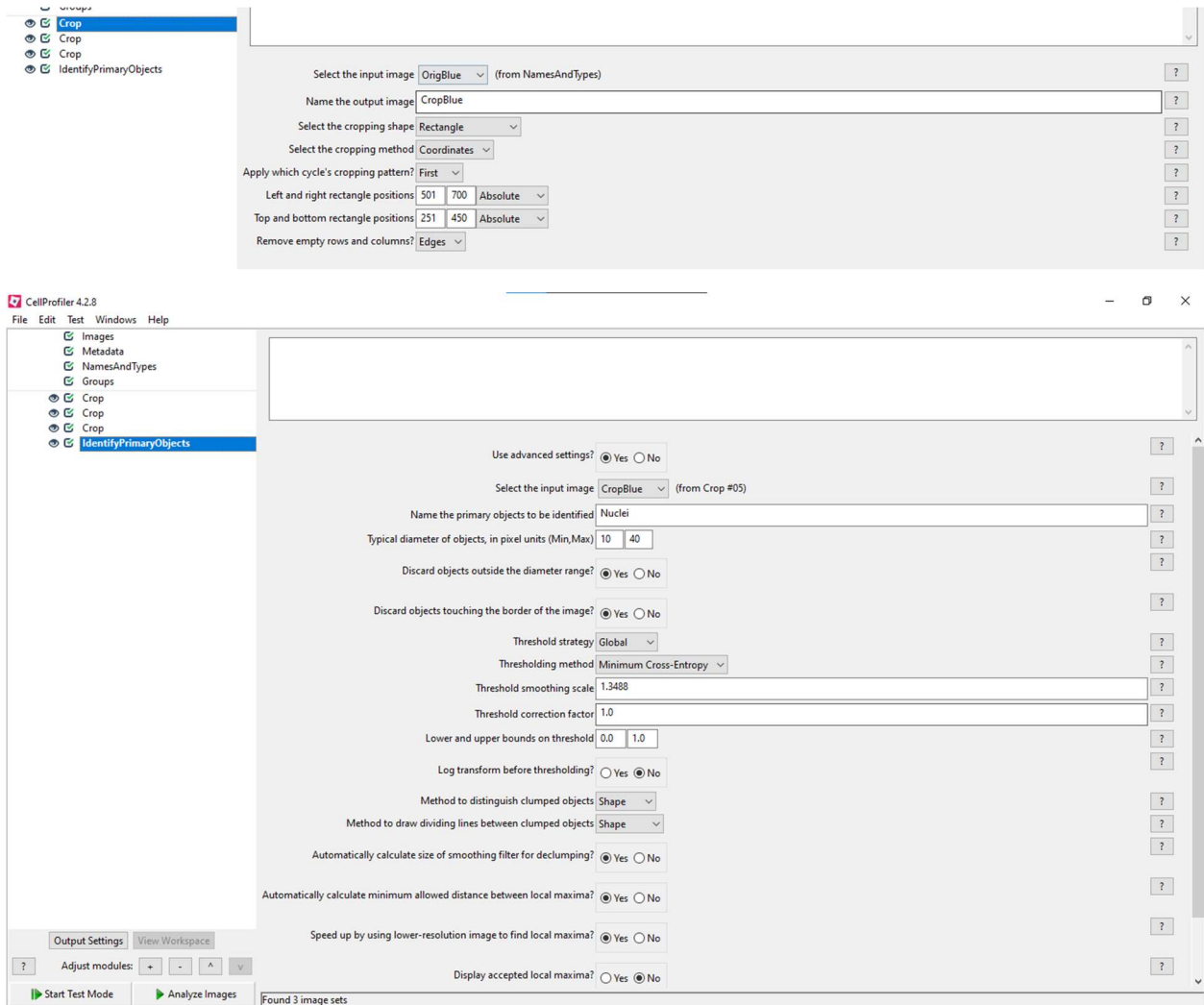
بخش اول: آماده سازی اولیه

با توجه به دستورالعمل داده شده گام های زیر را طی کردیم که خروجی هر گام در عکس ها موجود است.



بخش دوم: آماده سازی پایپ لاین

برای آماده سازی پایپ لاین به ترتیب module های خواسته شده را با پارامتر های خواسته شده اضافه میکنیم. شکل های زیر مرحله به مرحله این کار را نشان می دهند.



CellProfiler 4.2.8

File Edit Test Windows Help

- Images
- Metadata
- NamesAndTypes
- Groups
- Crop
- Crop
- Crop
- IdentifyPrimaryObjects
- IdentifySecondaryObjects
- IdentifyTertiaryObjects

Select the larger identified objects: Cells (from IdentifySecondaryObjects #09)

Select the smaller identified objects: Nuclei (from IdentifyPrimaryObjects #08)

Name the tertiary objects to be identified: Cytoplasm

Shrink smaller object prior to subtraction? ☒ Yes ☐ No

CellProfiler 4.2.8

File Edit Test Windows Help

- Images
- Metadata
- NamesAndTypes
- Groups
- Crop
- Crop
- Crop
- IdentifyPrimaryObjects
- IdentifySecondaryObjects
- IdentifyTertiaryObjects
- MeasureObjectSizeShape

Select object sets to measure

- ☒ Cells (from IdentifySecondaryObjects #09)
- ☒ Cytoplasm (from IdentifyTertiaryObjects #10)
- ☒ Nuclei (from IdentifyPrimaryObjects #08)

Calculate the Zernike features? ☒ Yes ☐ No

Calculate the advanced features? ☐ Yes ☒ No

CellProfiler 4.2.8

File Edit Test Windows Help

- Images
- Metadata
- NamesAndTypes
- Groups
- Crop
- Crop
- Crop
- IdentifyPrimaryObjects
- IdentifySecondaryObjects
- IdentifyTertiaryObjects
- MeasureObjectSizeShape
- MeasureObjectIntensity

Select images to measure

- ☒ CropBlue (from Crop #05)
- ☐ CropGreen (from Crop #06)
- ☐ CropRed (from Crop #07)
- ☐ OrigBlue (from NamesAndTypes)
- ☐ OrigGreen (from NamesAndTypes)
- ☐ OrigRed (from NamesAndTypes)

Select objects to measure

- ☒ Cells (from IdentifySecondaryObjects #09)
- ☒ Cytoplasm (from IdentifyTertiaryObjects #10)
- ☒ Nuclei (from IdentifyPrimaryObjects #08)

CellProfiler 4.2.8

File Edit Test Windows Help

- Images
- Metadata
- NamesAndTypes
- Groups
- Crop
- Crop
- Crop
- IdentifyPrimaryObjects
- IdentifySecondaryObjects
- IdentifyTertiaryObjects
- MeasureObjectSizeShape
- MeasureObjectIntensity
- MeasureTexture

Select images to measure

- ☒ CropBlue (from Crop #05)
- ☐ CropGreen (from Crop #06)
- ☐ CropRed (from Crop #07)
- ☐ OrigBlue (from NamesAndTypes)
- ☐ OrigGreen (from NamesAndTypes)
- ☐ OrigRed (from NamesAndTypes)

Measure whole images or objects? Both

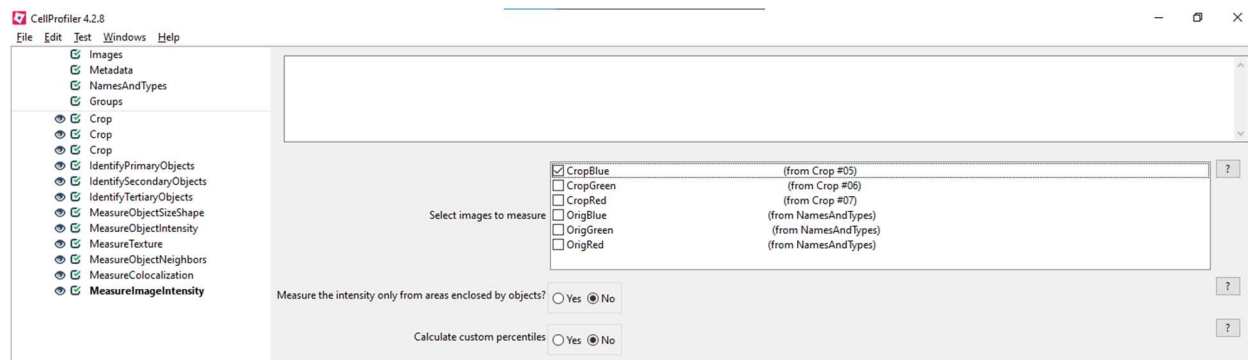
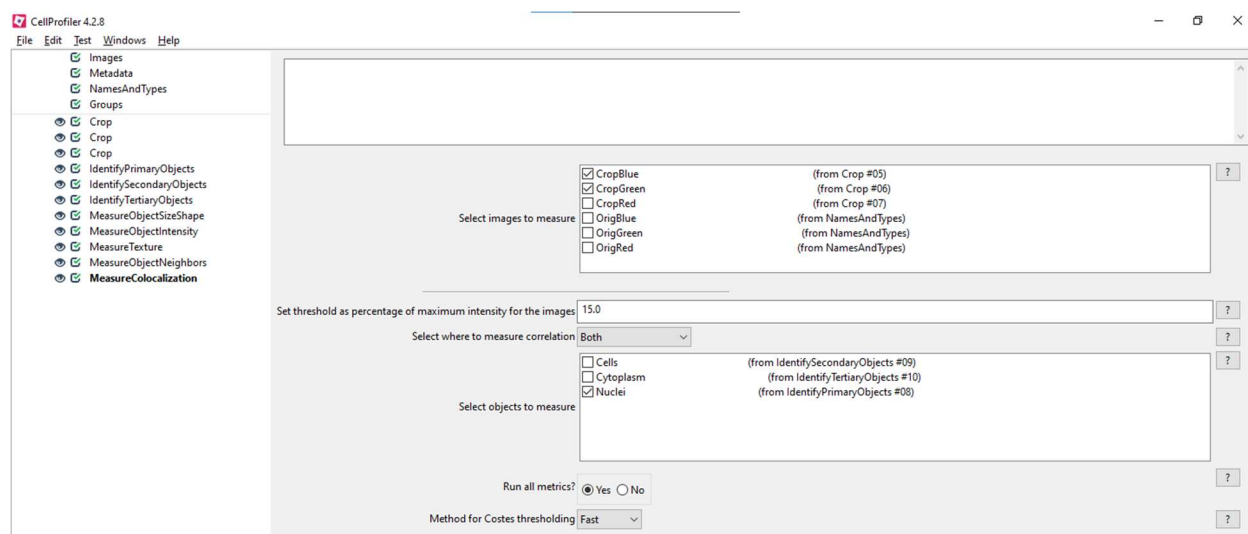
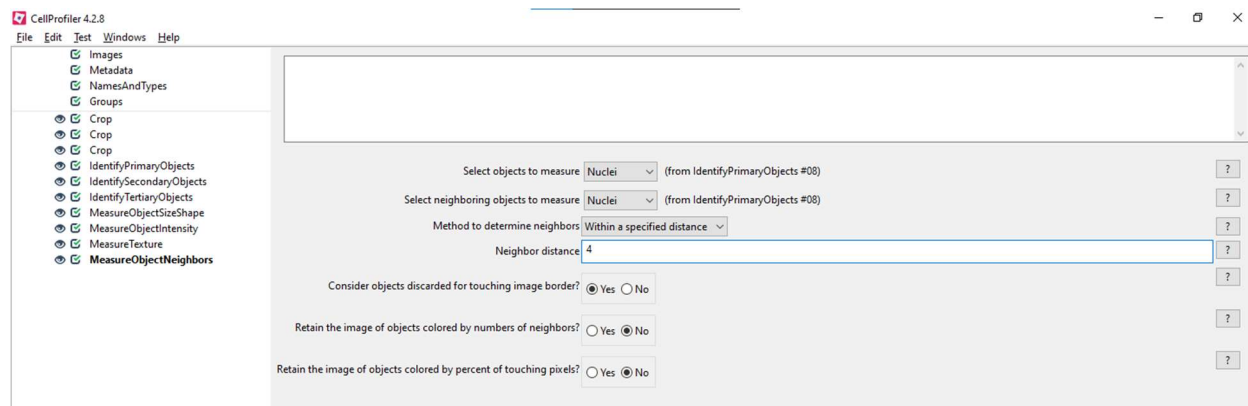
Select objects to measure

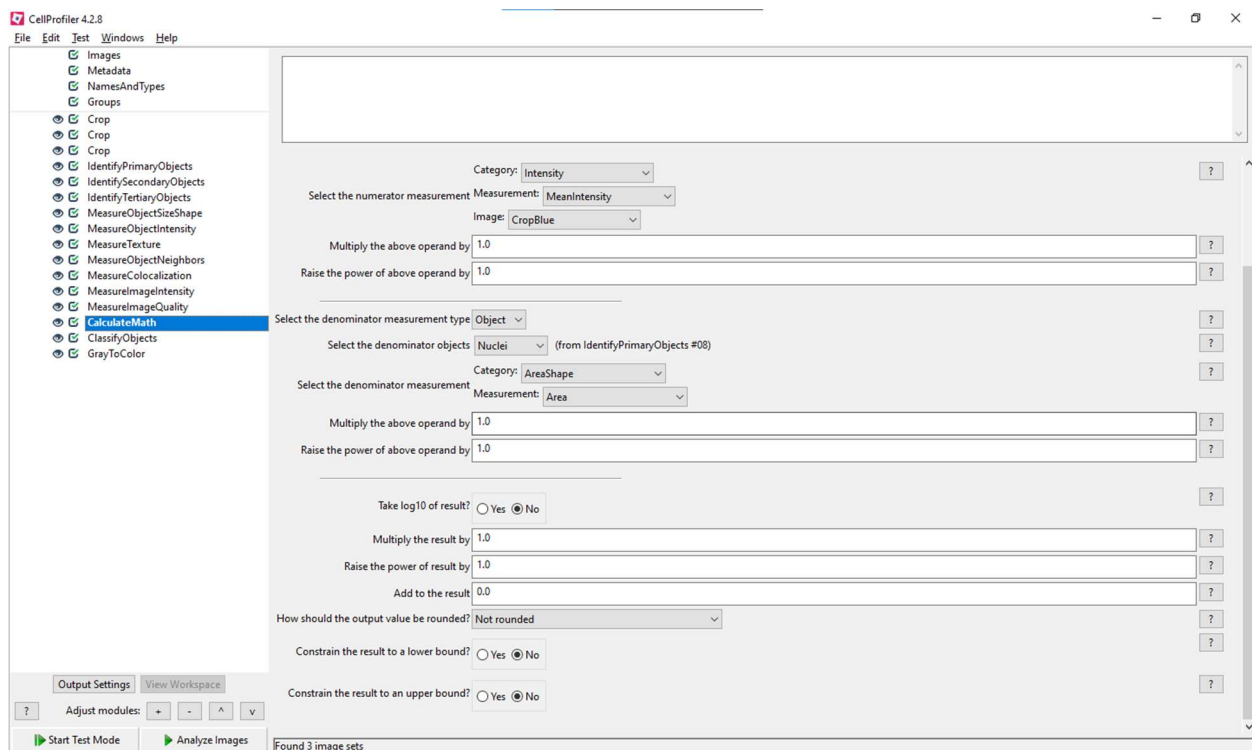
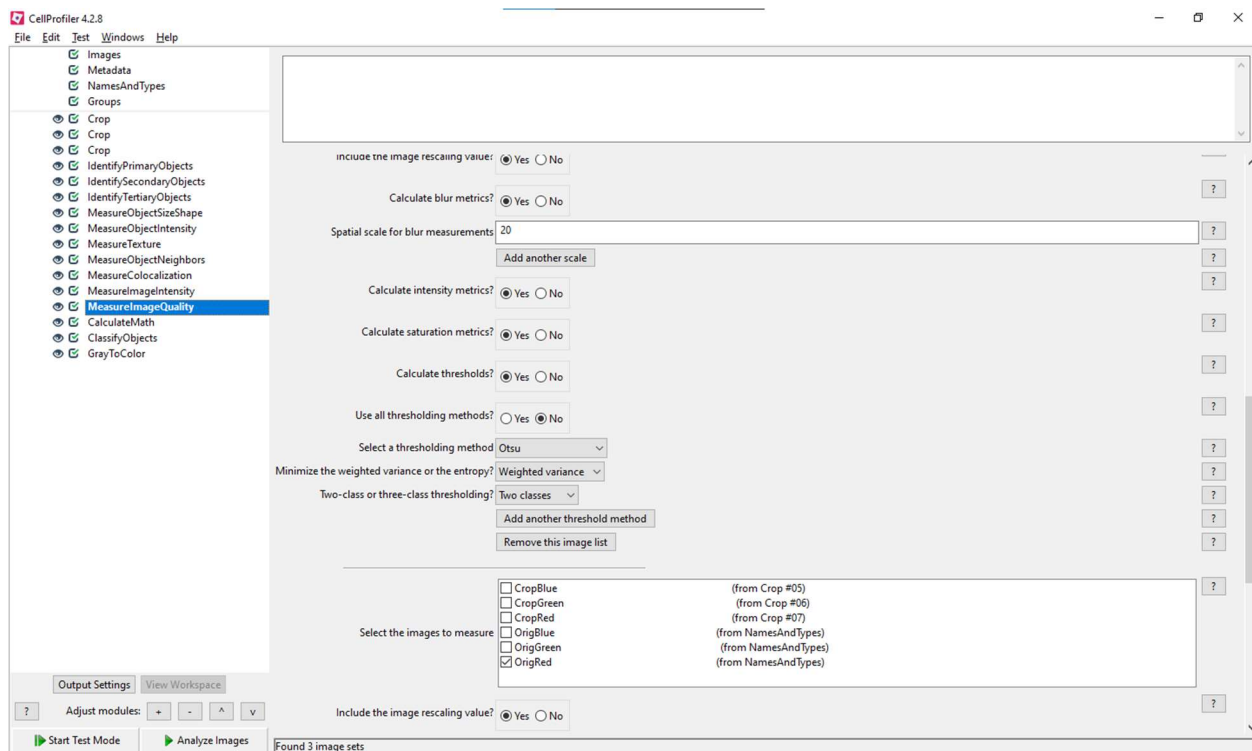
- ☒ Cells (from IdentifySecondaryObjects #09)
- ☒ Cytoplasm (from IdentifyTertiaryObjects #10)
- ☒ Nuclei (from IdentifyPrimaryObjects #08)

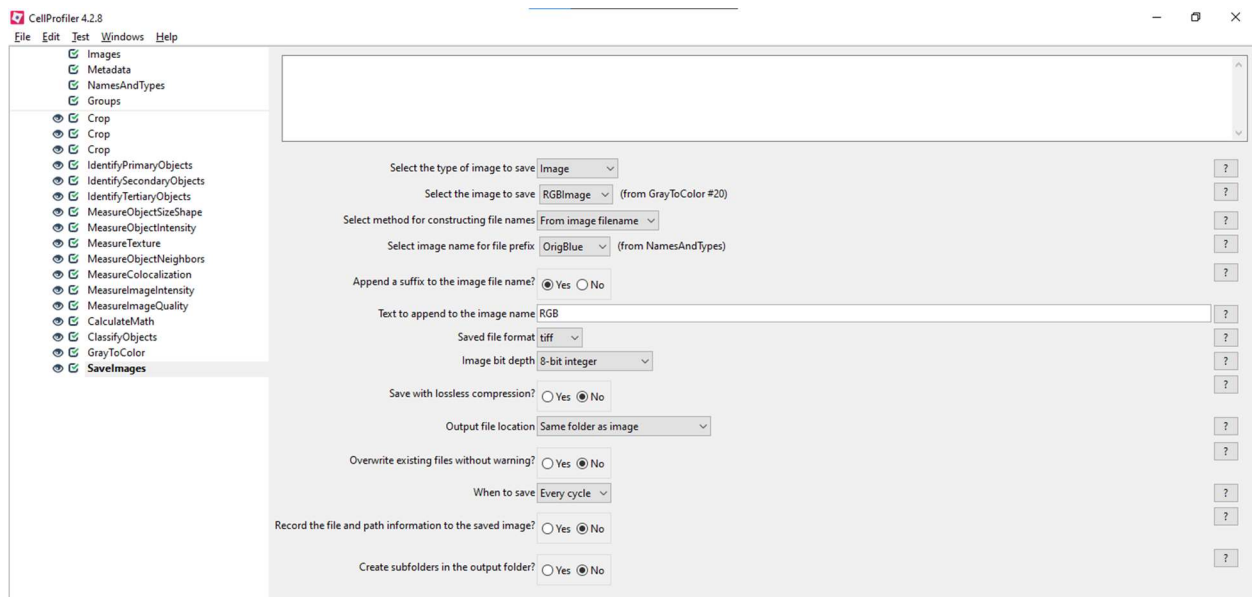
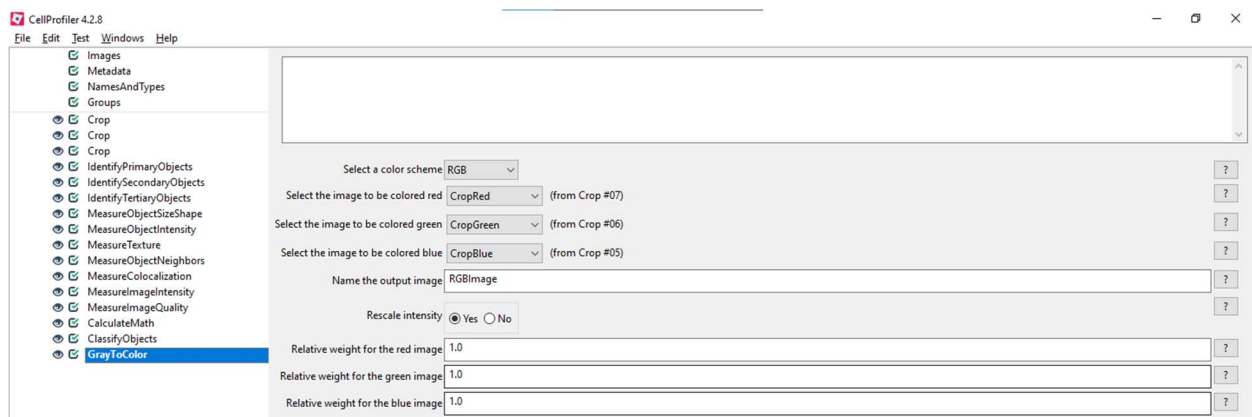
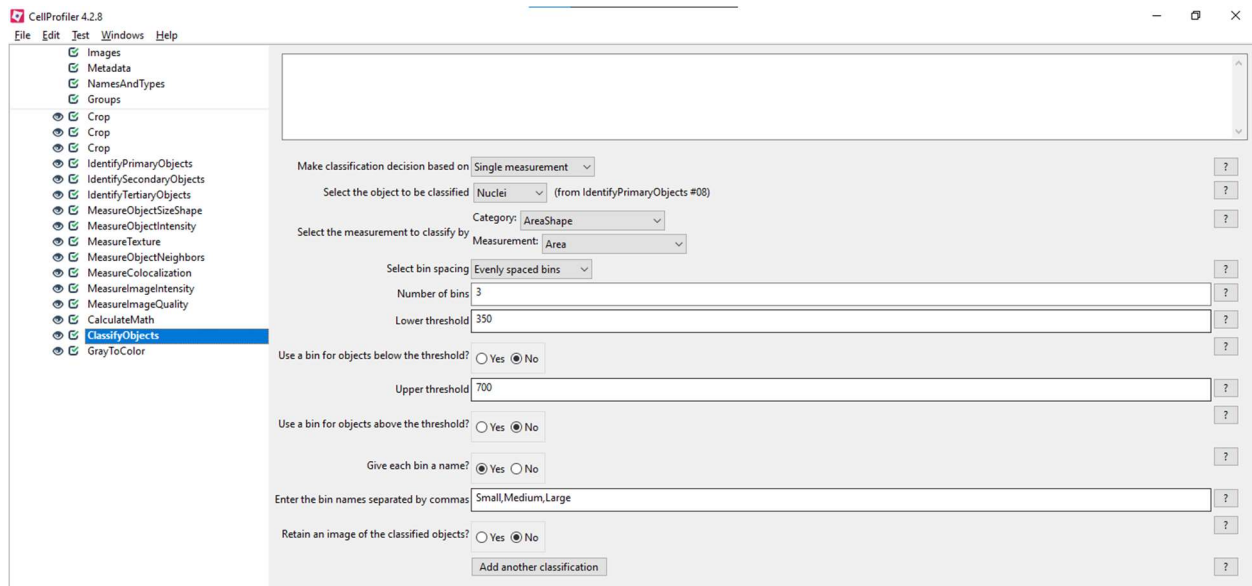
Enter how many gray levels to measure the texture at: 256

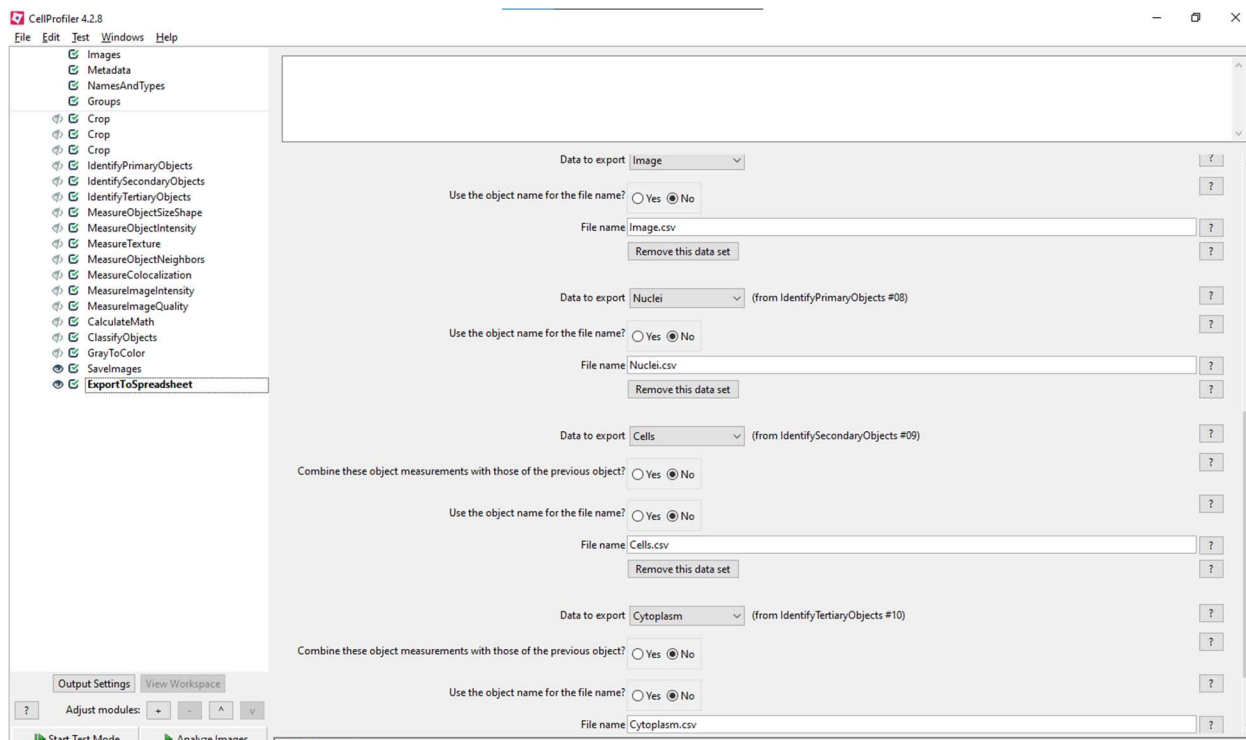
Texture scale to measure: 3

Add another scale



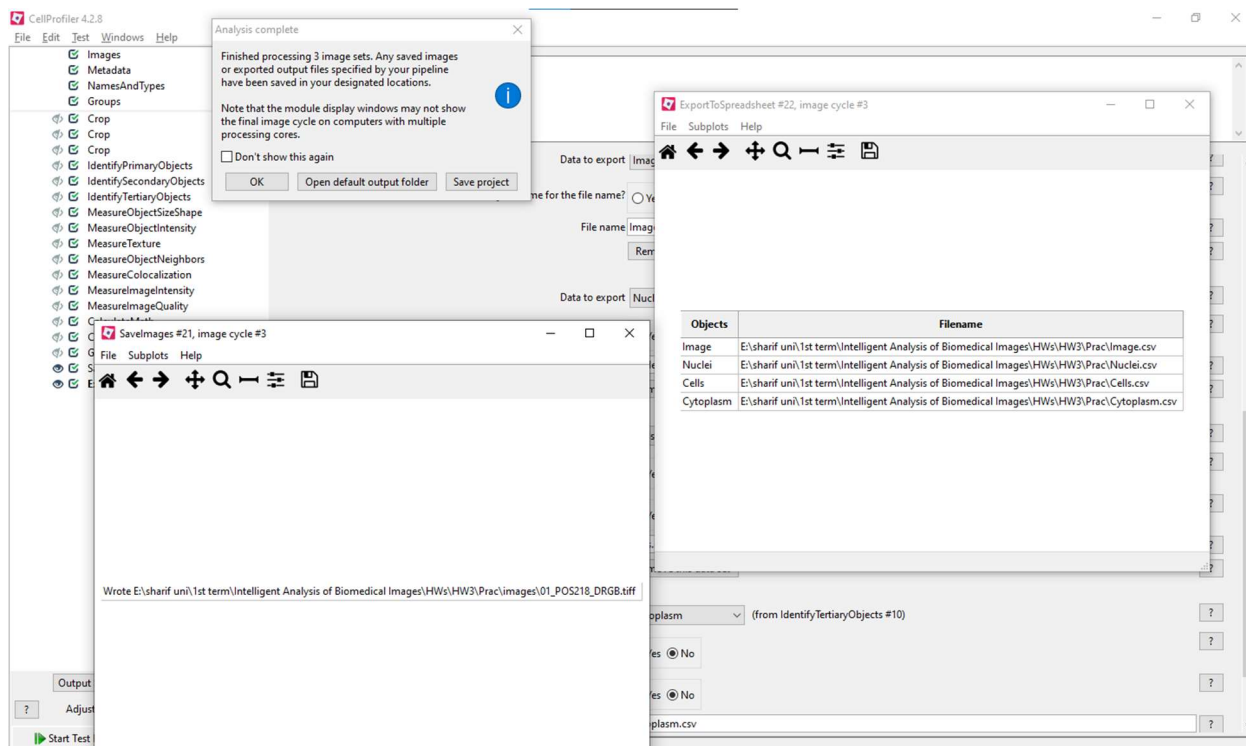






بخش سوم: موارد تحویلی

نتیجه اجرای پایپ لاین در ادامه آمده است. همچنین فایل های خواسته شده ضمیمه شده اند.



جواب سوال های خواسته شده با توجه به فایل های CSV:

۱. با توجه به ستون Count_Nuclei در فایل Image.csv تعداد هسته ها در هر نمونه به شکل زیر است:

نمونه اول: ۲۰ هسته

نمونه دوم: ۲۴ هسته

نمونه سوم: ۱۹ هسته

	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
1	Correlatio	Correlatio	Correlatio	Correlatio	Correlatio	Correlatio	Correlatio	Correlatio	Count_Cells	Count_Cytoplasm	Count_Nuclei	Crop_Arei	Crop_Arei	Crop_Arei	Crop_Orig	Crop_Orig	Crop_Orig	Execution	Execut
2	0.94304	0.795722	0.970424	0.553838	0.866255	0.793985	0.454366	0.580736	20	20	20	39601	39601	39601	1006000	1006000	1006000	0	
3	0.446542	1.775263	0.968105	0.402387	0.890353	0.73238	0.329691	0.086736	24	24	24	39601	39601	39601	1006000	1006000	1006000	0	
4	0.416789	1.991817	0.988709	0.249976	0.911135	0.723801	0.198384	0.203243	19	19	19	39601	39601	39601	1006000	1006000	1006000	0	

۲. با در نظر گرفتن سه ستون اول و مقادیر موجود در ستون AreaShape_Area مقادیر خواسته شده به شرح زیر هستند:

نمونه اول: ۳۰۰

نمونه دوم: ۴۱۶

نمونه سوم: ۷۲

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	ImageNumber	ObjectNumber	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area	AreaShape_Area
2	1	1	86	486	149	37	122	19	135.1047	28.06977	6.843663	398	0.72185	10.46416	0	0.176955	0.146121	35.25389	26.30589
3	1	2	504	1178	48	59	10	28	32.29365	45.5377	3.841906	744	0.650178	25.33205	0	0.427844	0.260287	35.93829	37.05401
4	1	3	994	2106	103	86	64	32	80.28773	58.27364	5.61332	1501	0.814403	35.57527	0	0.471985	0.178148	58.20252	53.03772
5	1	4	332	899	31	78	0	49	10.06024	63.27108	5.506431	635	0.538695	20.56005	0	0.369299	0.181606	35.81248	34.98571
6	1	5	567	1200	68	81	28	51	48.7425	67.8448	3.344406	810	0.878258	26.8687	0	0.4725	0.299007	44.97415	41.78516
7	1	6	154	560	146	91	118	71	133.1948	82.08442	4.939428	347	0.762327	14.00282	0	0.275	0.202453	28.2543	28.16026
8	1	7	604	1840	46	104	0	64	14.6904	88.05298	5.465165	1254	0.756699	27.73151	0	0.328261	0.182977	51.46971	49.65884
9	1	8	1752	2860	136	123	81	71	101.7574	97.08162	2.507006	2081	0.480723	47.23045	0	0.612587	0.398882	53.97668	59.48109
10	1	9	1279	2340	84	117	24	78	61.33385	98.40891	3.614627	1817	0.653506	40.35435	0	0.546581	0.276654	53.81994	59.84146
11	1	10	300	792	173	120	149	87	158.24	102.5467	5.308668	518	0.797658	19.5441	0	0.378788	0.188371	38.25631	34.17601
12	1	11	1104	2394	152	145	110	88	132.5344	118.6431	4.29667	1547	0.772718	37.49209	0	0.461153	0.232738	57.79721	59.23681
13	1	12	440	1054	34	134	0	103	14.33864	114.7523	5.73416	824	0.589023	23.66908	0	0.417457	0.174393	39.30438	36.76955
14	1	13	316	841	180	133	151	104	164.2278	122.1424	4.261337	569	0.564912	20.05851	0	0.375743	0.234668	30.88787	30.4795
15	1	14	1157	2478	85	153	26	111	47.4382	128.9896	4.883269	1836	0.810434	38.38148	0	0.466909	0.204781	63.31104	58.54912

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
29	2	8	344	810	199	58	172	28	187.2558	42.5407	4.890378	610	0.736707	20.92832	0	0.424691	0.204483	38.1746	32.55764
30	2	9	479	1326	144	61	105	27	122.9916	42.0167	5.123705	826	0.36658	24.69578	0	0.361237	0.195171	38.2474	38.63936
31	2	10	416	1248	58	65	19	33	36.31971	52.24279	5.897264	768	0.491792	23.01451	0	0.333333	0.16957	39.16723	38.47077
32	2	11	865	2728	94	95	50	33	70.96879	64.33642	8.489175	1791	0.690233	33.18663	0	0.317082	0.117797	60.54535	62.16912
33	2	12	479	1462	120	87	86	44	98.38622	65.14823	6.404184	868	0.861219	24.69578	0	0.327633	0.156148	53.02149	44.94441
34	2	13	571	2585	175	86	128	31	146.8722	54.32399	8.818325	1480	0.744401	26.9633	0	0.22089	0.1134	62.97059	55.31727
35	2	14	390	1221	136	93	99	60	122.3256	76.98974	5.860047	783	0.442246	22.2837	0	0.31941	0.170647	38.65154	37.10795
36	2	15	495	2538	189	101	135	54	161.297	79.60202	9.914519	1441	0.904143	25.10485	0	0.195035	0.100862	79.12285	59.16925
37	2	16	741	1802	66	96	13	62	38.98111	79.58435	6.08135	1369	0.763385	30.71596	0	0.41121	0.164437	60.67416	52.7731
38	2	17	373	1520	127	120	87	82	103.9062	94.67828	7.103214	905	0.433125	21.79262	0	0.245395	0.140781	40.27611	39.62323
39	2	18	140	754	133	121	107	92	122.3786	105.1	8.017293	496	0.76059	13.35116	0	0.185676	0.12473	38.61374	31.06445
40	2	19	827	1978	69	136	23	93	45.70375	112.0774	6.292508	1566	0.688641	32.44949	0	0.418099	0.158919	58.36363	60.20797
41	2	20	698	1786	116	159	78	112	97.4957	132.533	9.280356	1349	0.679641	29.81143	0	0.390817	0.107754	48.25145	46.87217
42	2	21	660	2200	92	165	42	121	63.85909	144.9212	10.47097	1439	0.773138	28.98859	0	0.3	0.095502	55.54928	55.47071
43	2	22	663	1334	52	179	23	133	37.79638	153.9382	4.804224	971	0.874457	29.05439	0	0.497001	0.20815	53.86696	45.89118
44	2	23	518	1147	190	184	153	153	168.9151	168.6583	5.1811	857	0.661142	25.68147	0	0.451613	0.193009	41.25003	39
45	2	24	718	1440	80	199	44	159	62.81616	177.9499	5.475699	1144	0.417682	30.23551	0	0.498611	0.182625	42.02309	41.59327
46	3	1	367	961	75	31	44	0	57.52044	11.3079	5.068019	661	0.770005	21.61664	0	0.381894	0.197316	39.49705	37.80212
47	3	2	711	1480	115	37	75	0	94.90717	19.31083	4.867953	1165	0.52644	30.08776	0	0.480405	0.205425	47.68422	42.05948
48	3	3	562	1116	154	55	123	19	138.1779	35.68683	4.477458	857	0.718634	26.74996	0	0.503584	0.223341	42.14065	41.40048
49	3	4	645	1480	187	66	150	26	166.938	44.69612	5.316239	1089	0.419855	28.65728	0	0.435811	0.188103	43.75877	44.20407
50	3	5	747	1440	84	69	48	29	67.17001	45.75502	4.316862	1130	0.477552	30.84007	0	0.51875	0.23165	44.54293	41.04875
51	3	6	433	744	107	66	83	35	93.42032	48.50346	4.176332	639	0.614344	23.48005	0	0.581989	0.239445	34.93704	32.31099
52	3	7	995	1932	53	76	11	30	32.8995	52.26734	3.740866	1361	0.487975	35.59316	0	0.51501	0.267318	47.39694	46.2277
53	3	8	249	676	91	85	65	59	77.68675	70.53815	4.171958	428	0.695227	17.80552	0	0.368343	0.239696	26.82751	27.45906
54	3	9	1175	2400	199	104	149	56	176.606	79.68085	3.798602	1603	0.780452	38.67889	0	0.489583	0.263255	61.27134	59.64059
55	3	10	72	361	71	88	52	69	60.68056	78.15278	5.729578	276	0.323228	9.574615	0	0.199446	0.174533	24.77817	18.68154
56	3	11	936	1974	42	113	0	66	20.99252	87.75748	4.116272	1380	0.408068	34.52176	0	0.474164	0.242938	47.58909	46.38965

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