FlowCyt: A Comparative Study of Deep Learning Approaches for Multi-Class Classification in Flow Cytometry Benchmarking

Lorenzo Bini * LORENZO.BINI@UNIGE.CH
University of Geneva, Switzerland

Fatemeh Nassajian Mojarrad * FATEMEH.NASSAJIAN@UNIGE.CH
University of Geneva, Switzerland

Margarita Liarou MARGARITA.LIAROU@UNIGE.CH
University of Geneva, Switzerland

Thomas Matthes THOMAS.MATTHES@HCUGE.CH
Geneva University Hospital, Switzerland

Stéphane Marchand-Maillet STEPHANE.MARCHAND-MAILLET@UNIGE.CH
University of Geneva, Switzerland

Supplementary Material

Following Table 1 shows the graph statistics for every patient in our dataset for sub-population classification task, where the number of edges come from the kNN graph (we used $k = 7$) with added self-loops:

Table 1: Graph statistics for every patient of the dataset for sub-population classification task. For the sake of simplicity, every percentage value has been rounded to two decimal digits.

Patient	#Cells	#Edges	T Cells (%)	B Cells (%)	Monocytes (%)	Mast Cells (%)	Hematopoietic (%)
0	94664	757312	66439 (70.18%)	11773 (12.44%)	12768 (13.49%)	66 (0.07%)	3618 (3.82%)
1	21915	175320	7839 (35.77%)	2982 (13.61%)	6073 (27.71%)	100 (0.46%)	4921 (22.45%)
2	85217	681736	49738 (58.37%)	13307 (15.62%)	8938 (10.49%)	86 (0.10%)	13148 (15.43%)
3	76704	613632	44914 (58.55%)	7521 (9.81%)	16964 (22.12%)	138 (0.18%)	7167 (9.34%)
4	107637	861096	52221 (48.52%)	9787 (9.09%)	27350 (25.41%)	160 (0.15%)	18119 (16.83%)
5	76125	609000	26920 (35.36%)	4768 (6.26%)	30124 (39.57%)	158 (0.21%)	14155 (18.59%)
6	81182	649456	61417 (75.65%)	7484 (9.22%)	4753 (5.85%)	18 (0.02%)	7510 (9.25%)
7	48143	385144	30190 (62.71%)	10799 (22.43%)	3064 (6.36%)	68 (0.14%)	4022 (8.35%)
8	27137	217096	13667 (50.36%)	136 (0.50%)	4431 (16.33%)	30 (0.11%)	8873 (32.70%)
9	120654	965232	68396 (56.69%)	47653 (39.50%)	3788 (3.14%)	136 (0.11%)	681 (0.56%)
10	83704	669632	28560 (34.12%)	5313 (6.35%)	33976 (40.59%)	31 (0.04%)	15824 (18.90%)
11	27091	216726	19633 (72.47%)	1582 (5.84%)	5116 (18.88%)	3 (0.01%)	757 (2.79%)
12	37797	302376	22788 (60.29%)	3768 (9.97%)	8522 (22.55%)	232 (0.61%)	2487 (6.58%)
13	24626	197008	16627 (67.52%)	4307 (17.49%)	2156 (8.75%)	42 (0.17%)	1494 (6.07%)
14	114043	912344	86021 (75.43%)	12369 (10.85%)	11357 (9.96%)	51 (0.04%)	4245 (3.72%)
15	63750	510000	43842 (68.77%)	12719 (19.95%)	4764 (7.47%)	11 (0.02%)	2414 (3.79%)
16	109781	878248	37995 (34.61%)	39854 (36.30%)	20879 (19.02%)	278 (0.25%)	10775 (9.81%)
17	88001	704008	61466 (69.85%)	6487 (7.37%)	12614 (14.33%)	26 (0.03%)	7408 (8.42%)
18	20212	161696	12920 (63.92%)	3656 (18.09%)	2620 (12.96%)	27 (0.13%)	989 (4.89%)
19	49863	398904	38406 (77.02%)	3111 (6.24%)	4340 (8.70%)	40 (0.08%)	3966 (7.95%)
20	86991	695928	55871 (64.23%)	14300 (16.44%)	8307 (9.55%)	4 (0.00%)	8509 (9.78%)
21	74477	595816	46971 (63.07%)	15616 (20.97%)	5681 (7.63%)	38 (0.05%)	6171 (8.29%)
22	49774	398192	31063 (62.41%)	8375 (16.83%)	4699 (9.44%)	815 (1.64%)	4822 (9.69%)
23	133820	1070560	111218 (83.11%)	5749 (4.30%)	10868 (8.12%)	51 (0.04%)	5934 (4.43%)
24	53192	425536	37326 (70.17%)	576 (1.08%)	11163 (20.99%)	30 (0.06%)	4097 (7.70%)
25	66972	535776	42925 (64.09%)	974 (1.45%)	16500 (24.64%)	399 (0.60%)	6174 (9.22%)
26	22253	178024	8100 (36.40%)	11386 (51.17%)	2027 (9.11%)	4 (0.02%)	736 (3.31%)
27	42758	342064	24857 (58.13%)	51 (0.12%)	10836 (25.34%)	117 (0.27%)	6897 (16.13%)
28	64569	516552	50091 (77.58%)	3452 (5.35%)	5826 (9.02%)	271 (0.42%)	4929 (7.63%)
29	121287	970296	91772 (75.67%)	867 (0.71%)	5809 (4.79%)	149 (0.12%)	22690 (18.71%)

* These authors contributed equally.

Following Table 2 shows the graph statistics for every patient in our dataset for total population classification task, where the number of edges come from the kNN graph (we used $k = 7$) with added self-loops:

Table 2: Graph statistics for every patient of the dataset for total population classification task. For the sake of simplicity, every percentage value has been rounded to two decimal digits.

Patient	#Cells	#Edges	T Cells	B Cells	Monocytes	Mast Cells	Hematopoietic	Others
0	544330	4354640	66439	11773	12768	66	3618	449666
1	272233	2177864	7839	2982	6073	100	4921	250318
2	586288	4690304	49738	13307	8938	86	13148	501071
3	674691	5397528	44914	7521	16964	138	7167	597987
4	1000000	8000000	52221	9787	27350	160	18119	892363
5	1000000	8000000	26920	4768	30124	158	14155	923875
6	1000000	8000000	61417	7484	4753	18	7510	918818
7	1000000	8000000	30190	10799	3064	68	4022	951857
8	507682	4061456	13667	136	4431	30	8873	480545
9	1000000	8000000	68396	47653	3788	136	681	879346
10	1000000	8000000	28560	5313	33976	31	15824	916296
11	503553	4028424	19633	1582	5116	3	757	476462
12	417477	3339816	22788	3768	8522	232	2487	379680
13	345006	2760048	16627	4307	2156	42	1494	320380
14	921600	7372800	86021	12369	11357	51	4245	807557
15	253547	2028376	43842	12719	4764	11	2414	189797
16	1000000	8000000	37995	39854	20879	278	10775	890219
17	1000000	8000000	61466	6487	12614	26	7408	911999
18	437252	3498016	12920	3656	2620	27	989	417040
19	519155	4153240	38406	3111	4340	40	3966	469292
20	1000000	8000000	55871	14300	8307	4	8509	913009
21	1000000	8000000	46971	15616	5681	38	6171	925523
22	545168	4361344	31063	8375	4699	815	4822	495394
23	1000000	8000000	111218	5749	10868	51	5934	866180
24	1000000	8000000	37326	576	11163	30	4097	946808
25	314515	2516120	42925	974	16500	399	6174	247543
26	559344	4474752	8100	11386	2027	4	736	537091
27	819200	6553600	24857	51	10836	117	6897	776442
28	100000	8000000	50091	3452	5826	271	4929	935431
29	100000	8000000	91772	867	5809	149	22690	878713