

FIG. 1

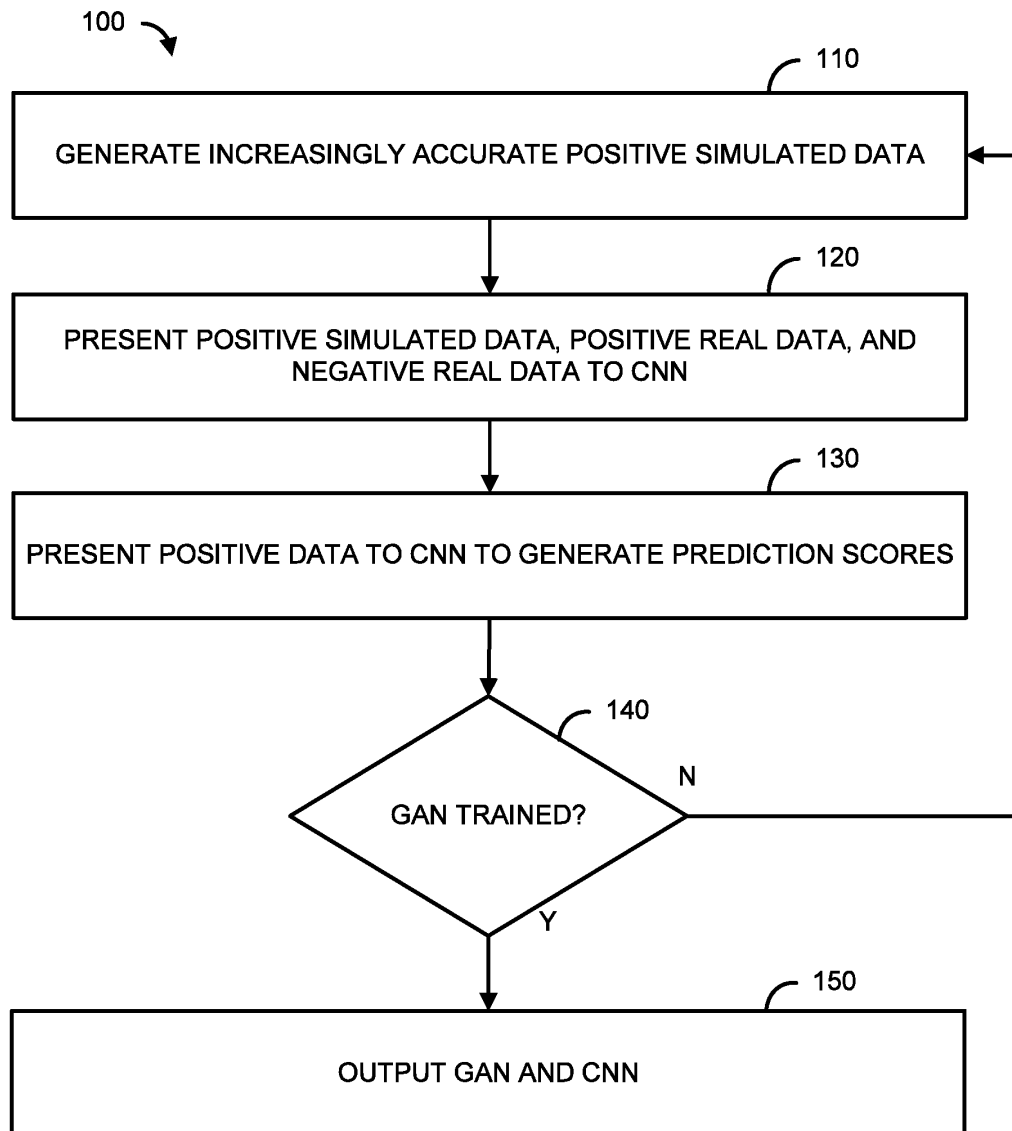
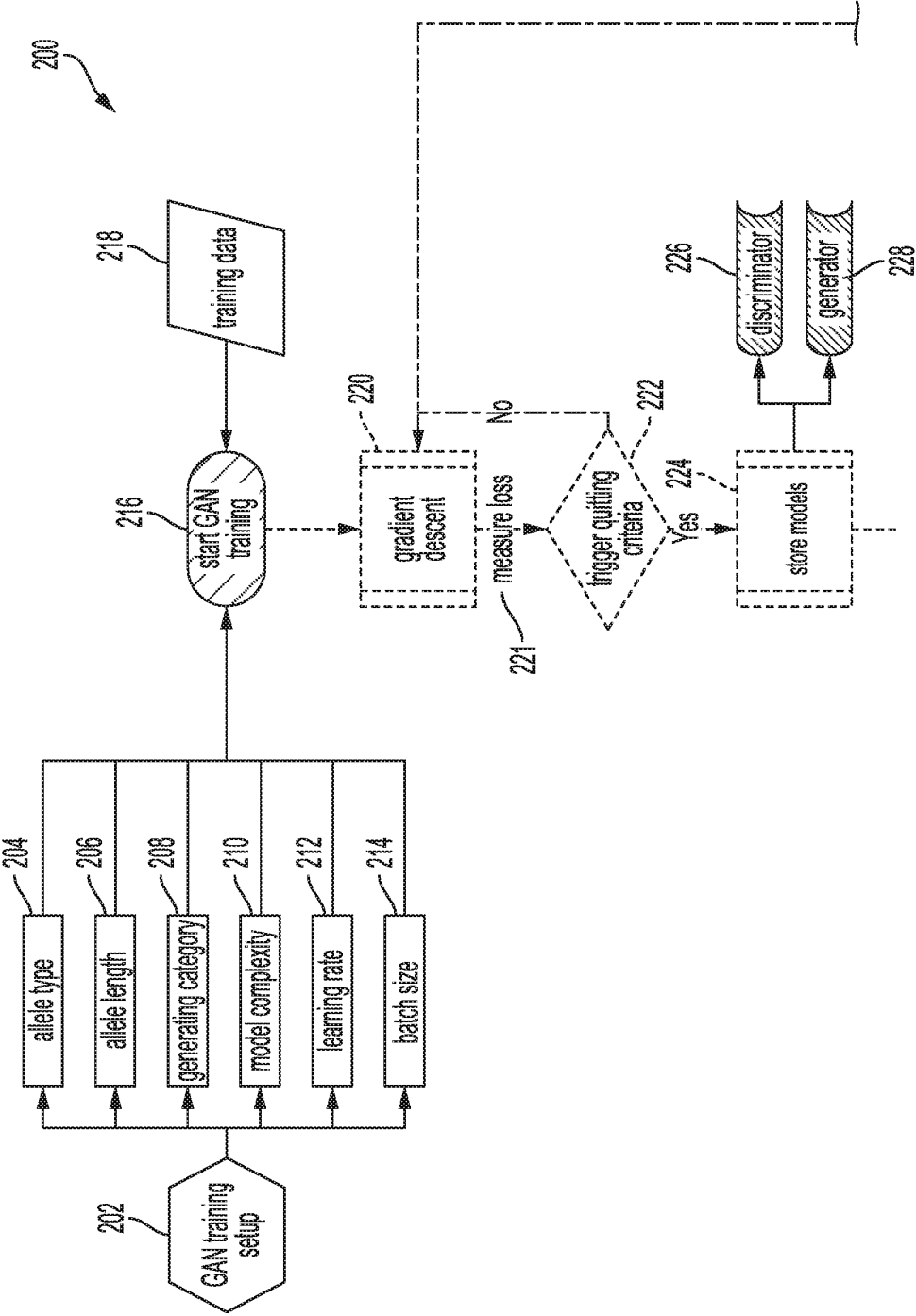


FIG. 2



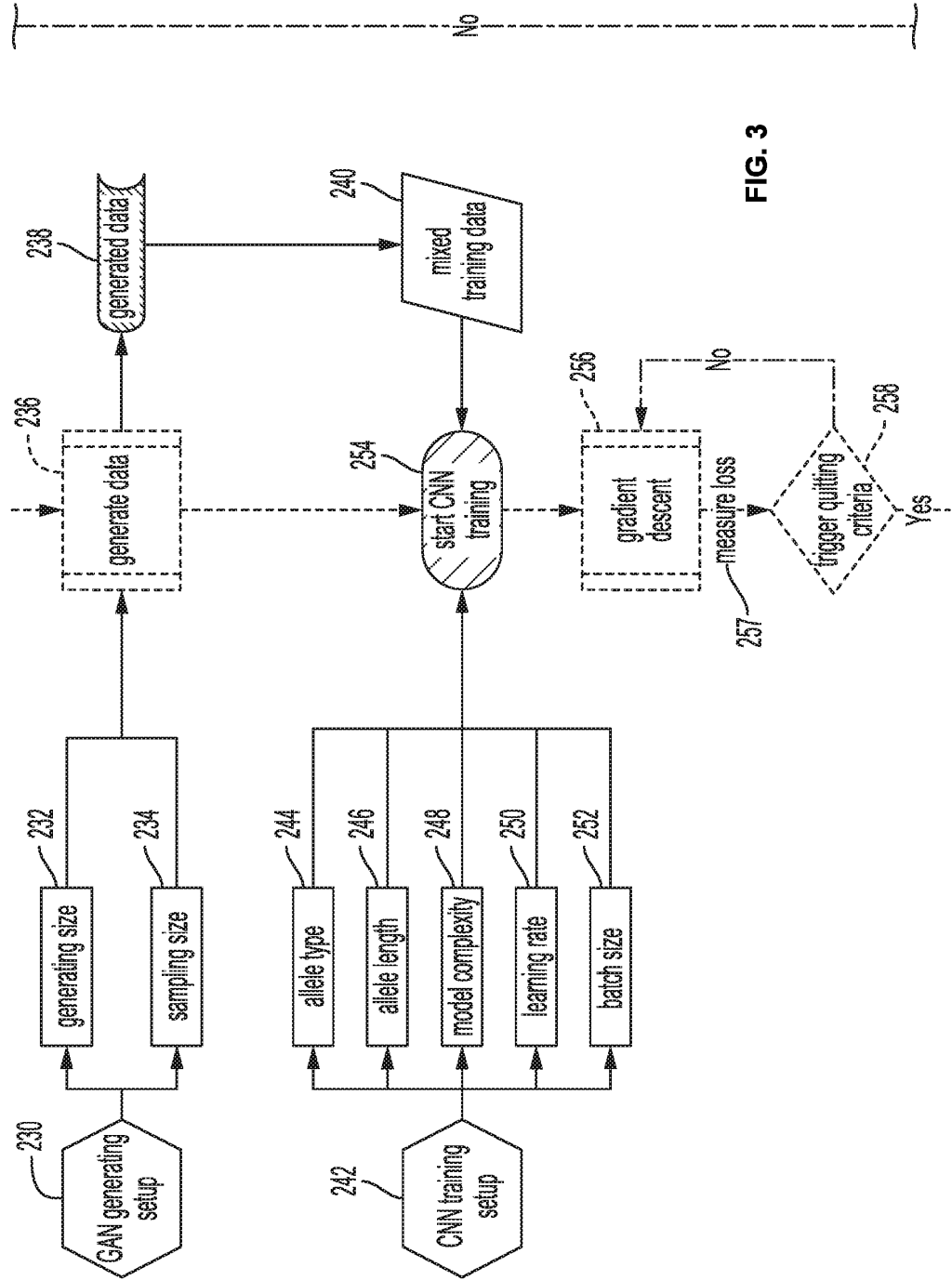


FIG. 3

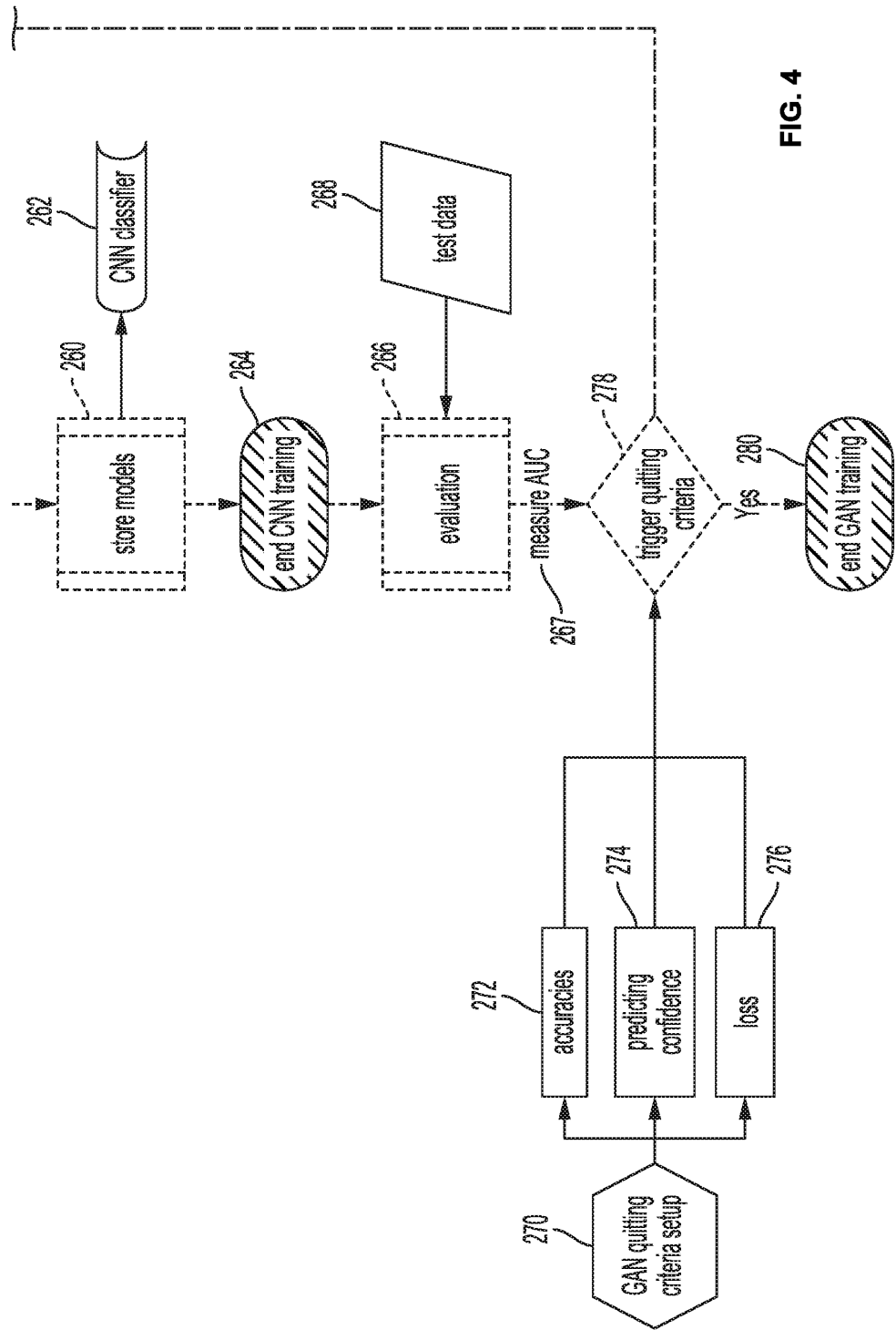


FIG. 4

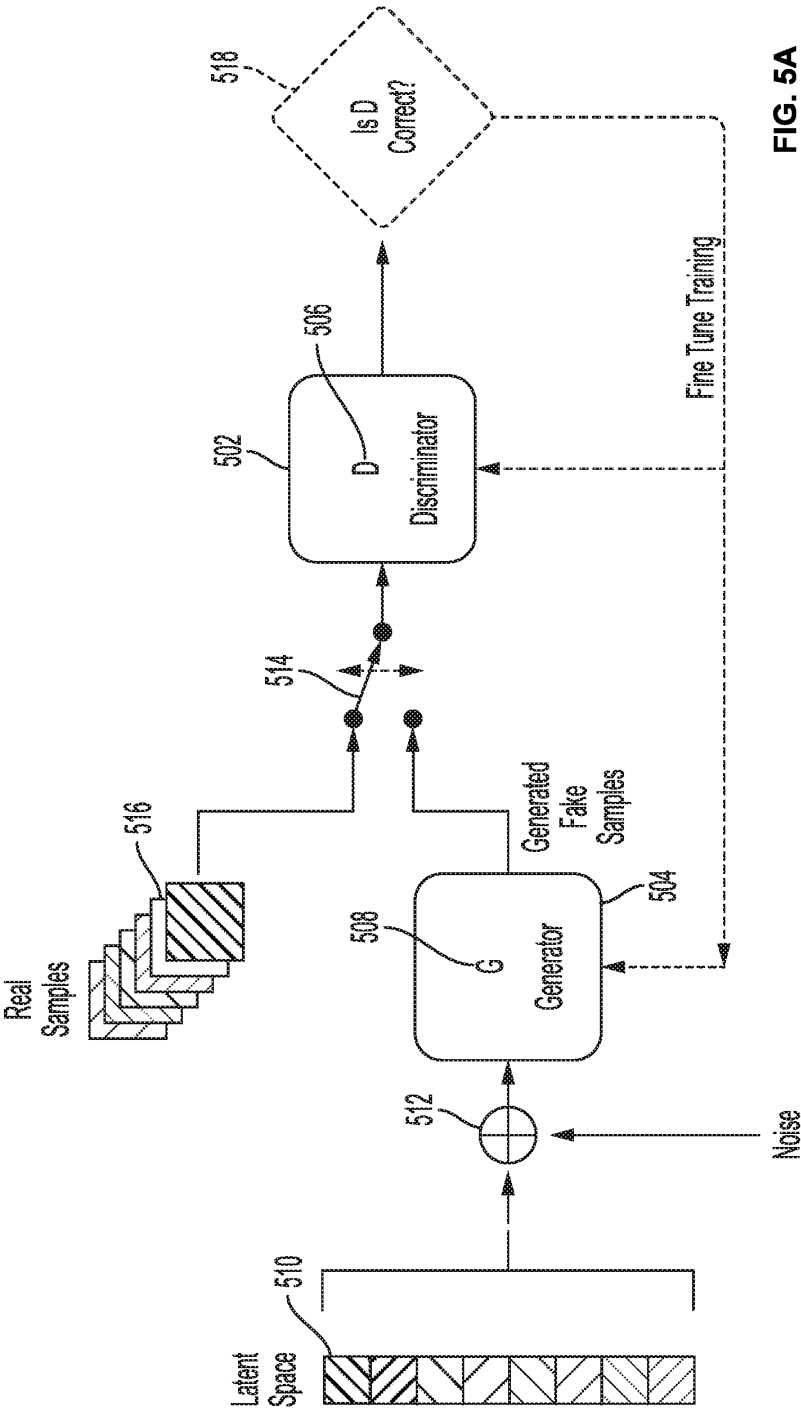


FIG. 5A

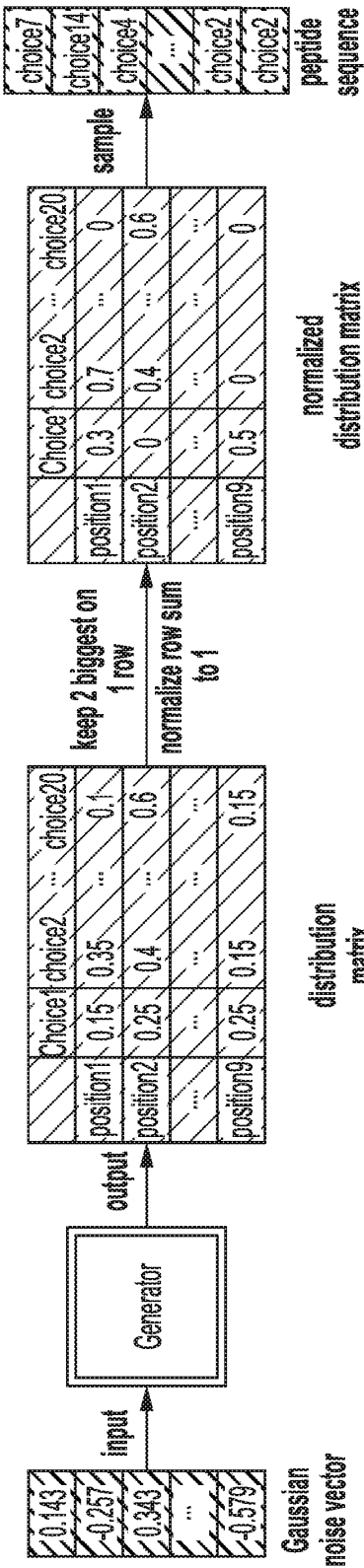


FIG. 5B

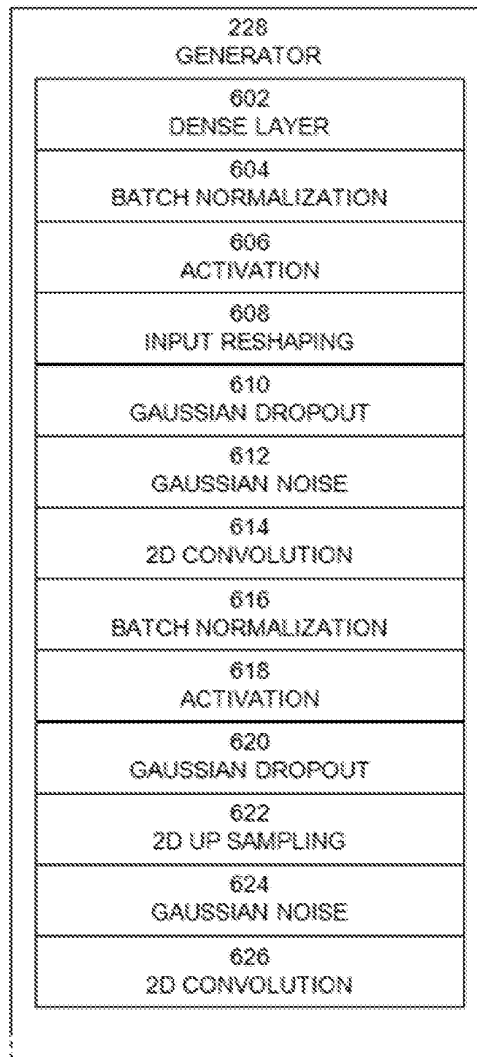
FIG. 6

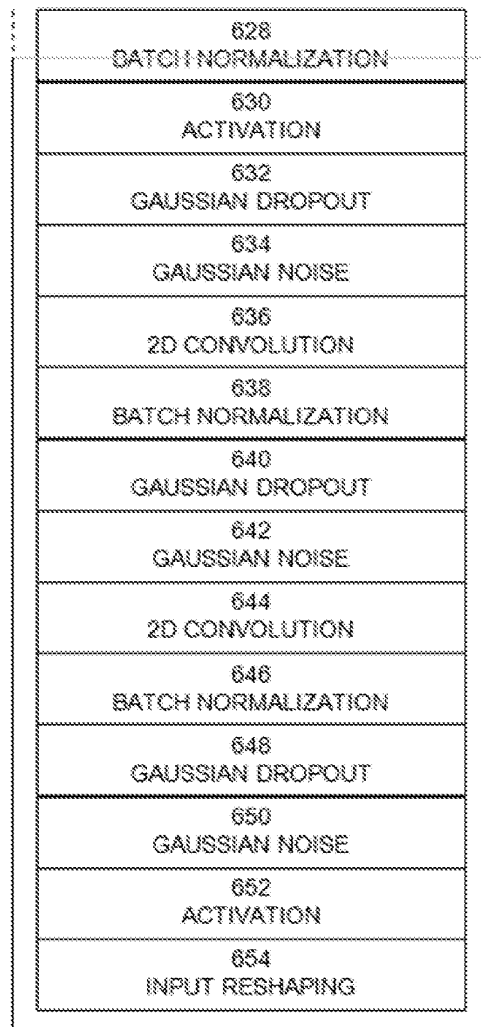
FIG. 7

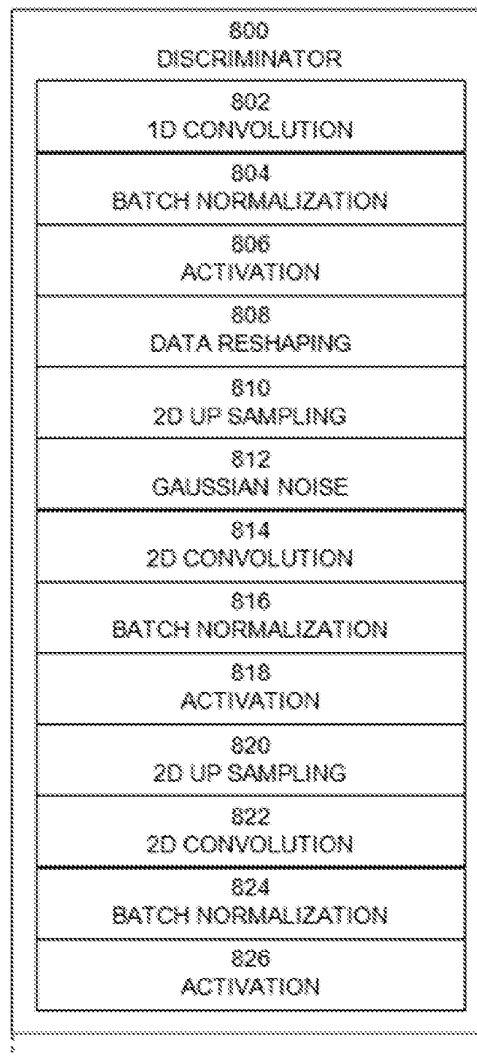
FIG.8

FIG. 9

828 2D CONVOLUTION
830 BATCH NORMALIZATION
832 ACTIVATION
834 2D CONVOLUTION
836 BATCH NORMALIZATION
838 ACTIVATION
840 DATA FLATTENING
842 DENSE GRADIENT
844 ACTIVATION
846 DENSITY GRADIENT
848 BATCH NORMALIZATION
850 ACTIVATION
852 ACTIVATION

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FIG. 10

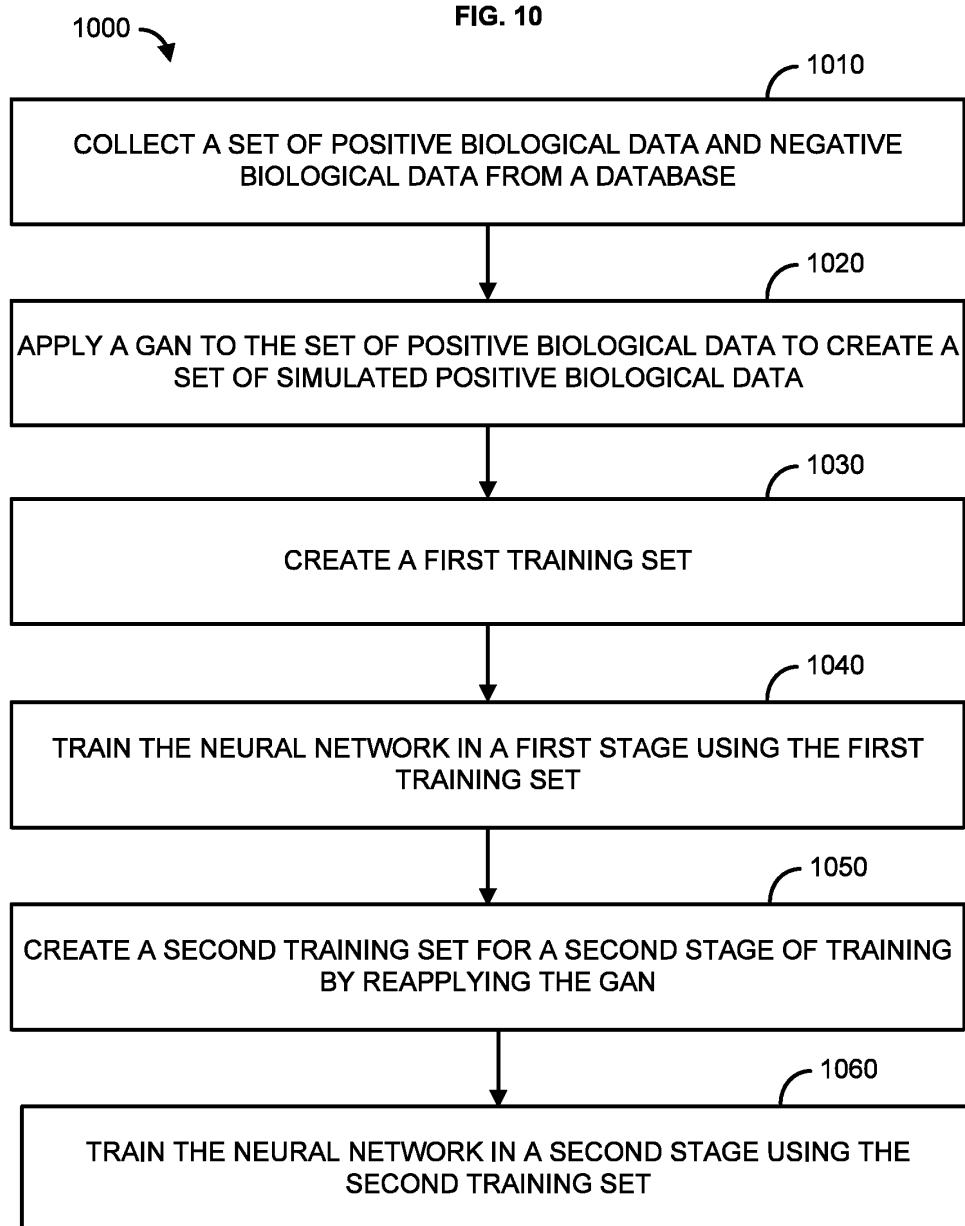


FIG. 11

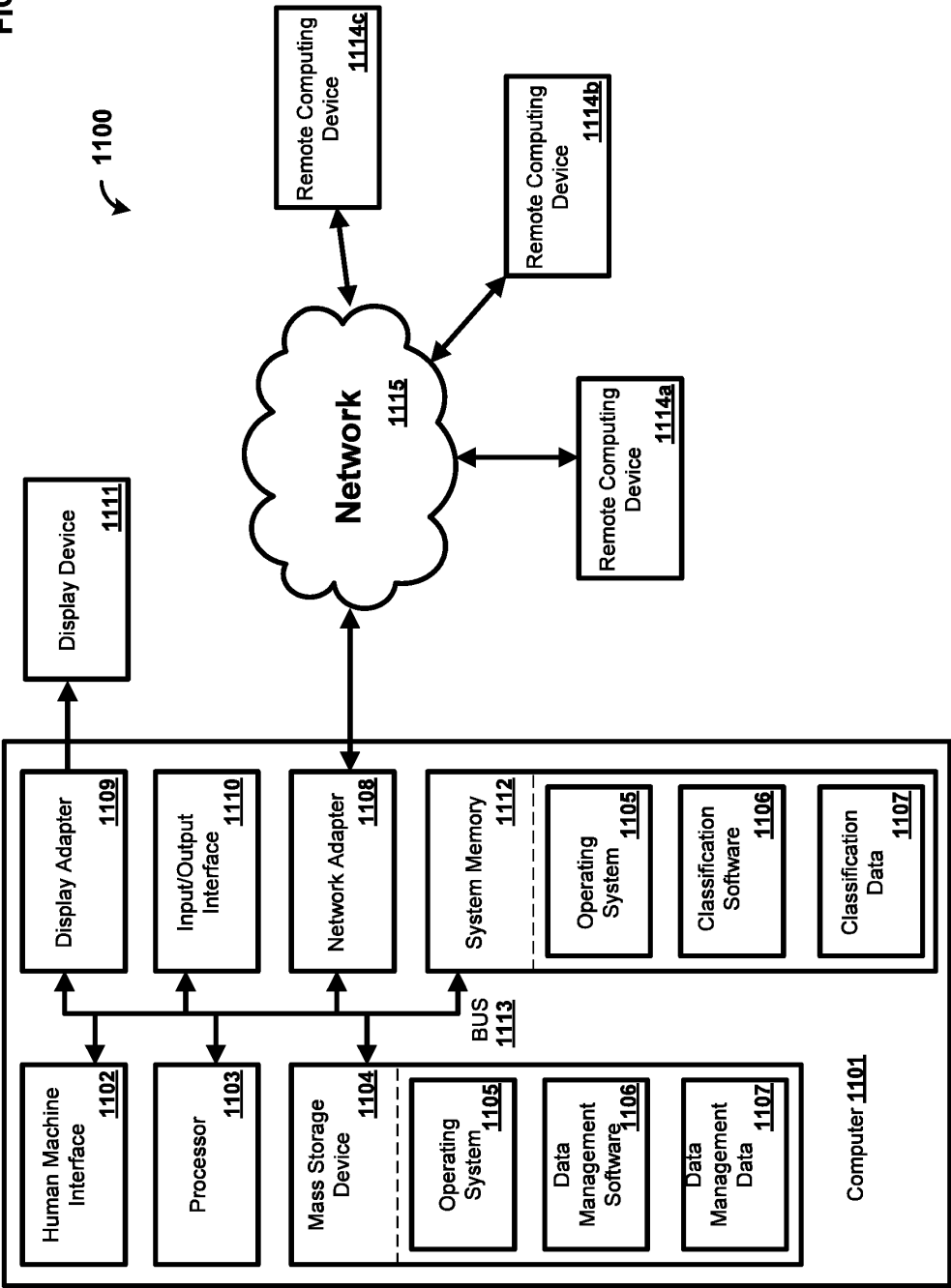


FIG. 12

IEDB	HLA	length	test_size	train_size	NetMHCpan	MHCflurry	CNN_Yeeling	CNN_ours	sNeubula	PSSM
1028824	A0201	9	77	10549	0.546	0.586	0.562	0.562	0.539	0.489
1028928	A0201	9	13	10549	0.955	0.955	0.955	0.955	0.909	0.955
1028790	A0201	9	55	10549	0.574	0.609	0.681	0.561	0.778	0.559
1028790	A0201	10	35	3187	0.677	0.685	0.589	0.742	0.704	0.605
1028790	A0202	9	55	1706	0.713	0.758	0.804	0.664	0.680	0.704
1028790	A0203	9	55	2711	0.696	0.684	0.746	0.682	0.629	0.678
1028790	A0203	10	35	1424	0.750	0.786	0.837	0.837	0.697	0.724
1028790	A0206	9	55	2195	0.770	0.775	0.819	0.822	0.848	0.769
1028790	A0206	10	35	1430	0.768	0.808	0.920	0.942	0.680	0.768
1028790	A6802	9	55	2871	0.806	0.816	0.909	0.891	0.713	0.838
1028790	A6802	10	35	1432	0.620	0.681	0.991	0.977	0.813	0.750
1028928	B0702	9	12	3640	1.000	1.000	1.000	1.000	0.900	1.000
315174	B2703	9	11	918	0.893	0.893	1.000	1.000	0.607	0.804
1029125	B2705	9	21	2439	0.959	0.949	0.918	0.898	0.959	0.959
1029061	B5701	9	26	2628	0.943	0.750	0.807	0.795	0.575	0.807

test_id	IEDB	HLA	length	test_size	train_size	bind_prop	bind_size
1	1029824	A0201	9	77	10549	0.548	5784
2	1029125	B2705	9	21	2439	0.305	743
4	1028928	A0201	9	13	10549	0.548	5784
7	1028790	A0201	9	55	10549	0.548	5784
8	1028790	A0201	10	35	3187	0.667	2126
9	1028790	A0202	9	55	1706	0.721	1231
10	1028790	A0203	9	55	2711	0.564	1531
11	1028790	A0203	10	35	1424	0.740	1054
15	1028790	A6802	10	35	1432	0.565	810

FIG. 13A

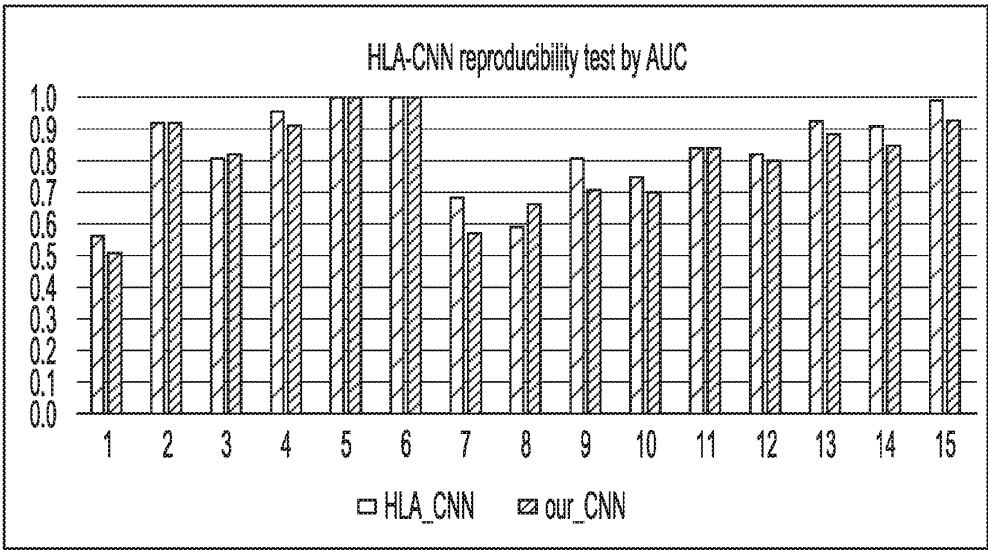


FIG. 13B

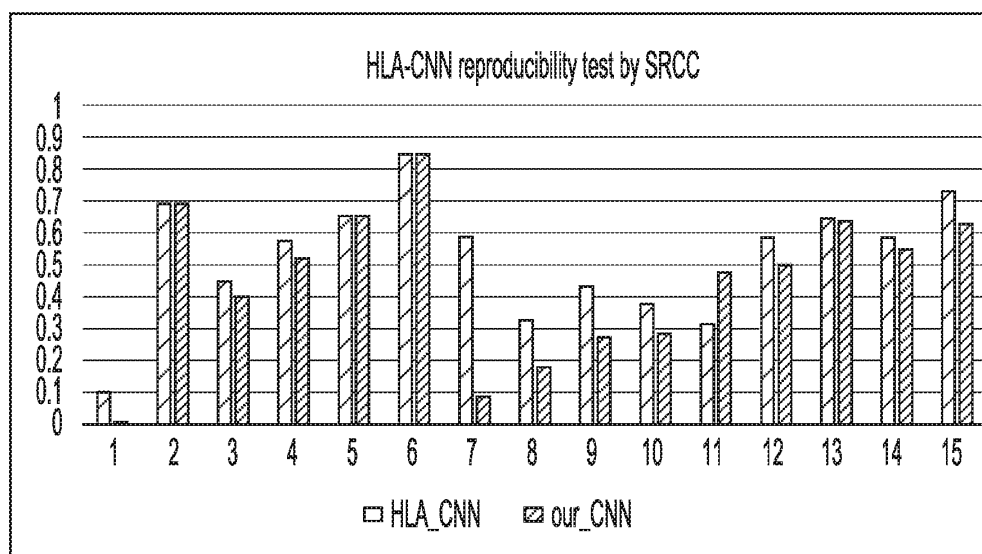


FIG. 13C

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	IEDB	HLA	length	test_size	NetMHCpanIIHClflury_2	HLA_CNNCNN_Adam	CNN*5	CNN*1	sNeubula	PSSM	best vs average	best AUC
1	1028824	A0201	9	77	0.546	0.508	0.562	0.539	0.539	0.489	7.61%	0.58588435
4	1028928	A0201	9	13	0.955	0.909	0.955	0.955	0.909	0.955	1.22%	0.955
7	1028790	A0201	9	55	0.574	0.572	0.561	0.583	0.778	0.559	20.85%	0.778
	IEDB	HLA	length	test_size	NetMHCpanIIHClflury_2	HLA_CNN	CNN	CNN*5	sNeubula	PSSM	best vs average	best AUC
1	1028824	A0201	9	77	0.071	0.096	0.09577579	0.06	0.06	-0.017056	51.89%	0.1325117
4	1028928	A0201	9	13	0.57	0.57	0.56980288	0.57	0.539	0.56980288	1.95%	0.57
7	1028790	A0201	9	55	0.615	0.58	0.0771945	0.114	0.505	0.07147077	56.67%	0.615

FIG. 14

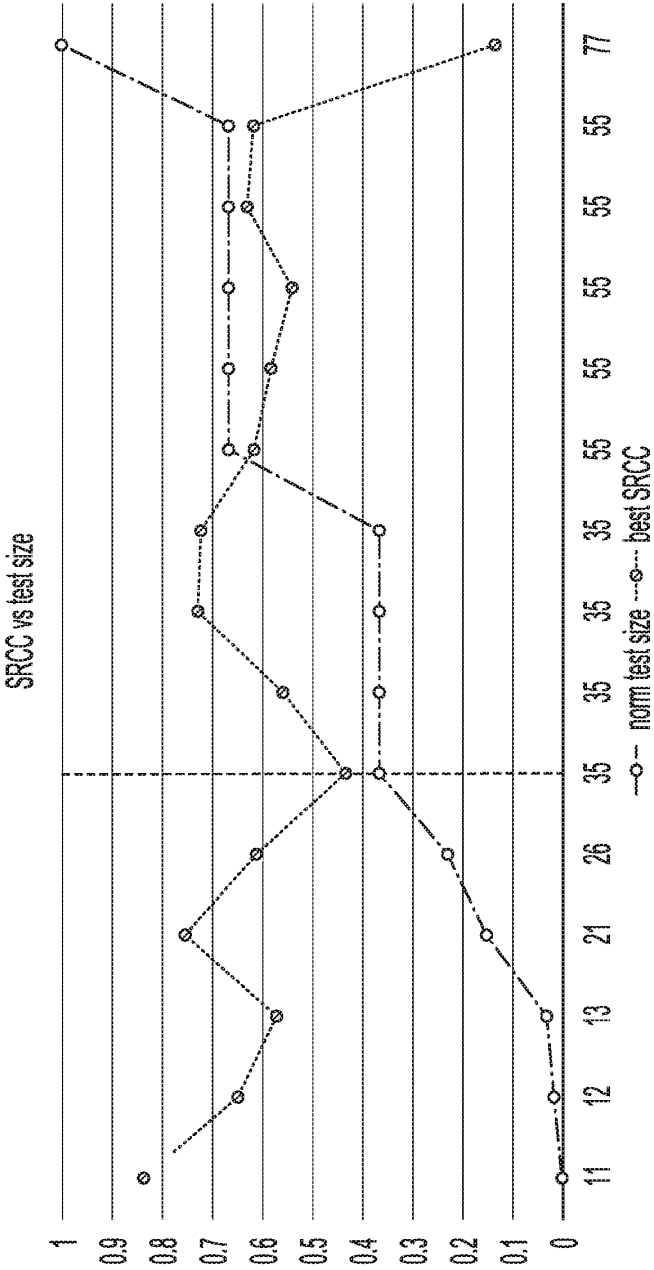


FIG. 15

test_id	IEDB	HLA	length	test_size	train_size	bind_prop	bind_size
1	1029824	A0201	9	77	10549	0.548	5784
2	1029125	B2705	9	21	2439	0.305	743
4	1028928	A0201	9	13	10549	0.548	5784
7	1028790	A0201	9	55	10549	0.548	5784
8	1028790	A0201	10	35	3187	0.667	2126
9	1028790	A0202	9	55	1706	0.721	1231
10	1028790	A0203	9	55	2711	0.564	1531
11	1028790	A0203	10	35	1424	0.740	1054
15	1028790	A6802	10	35	1432	0.565	810

FIG. 16A

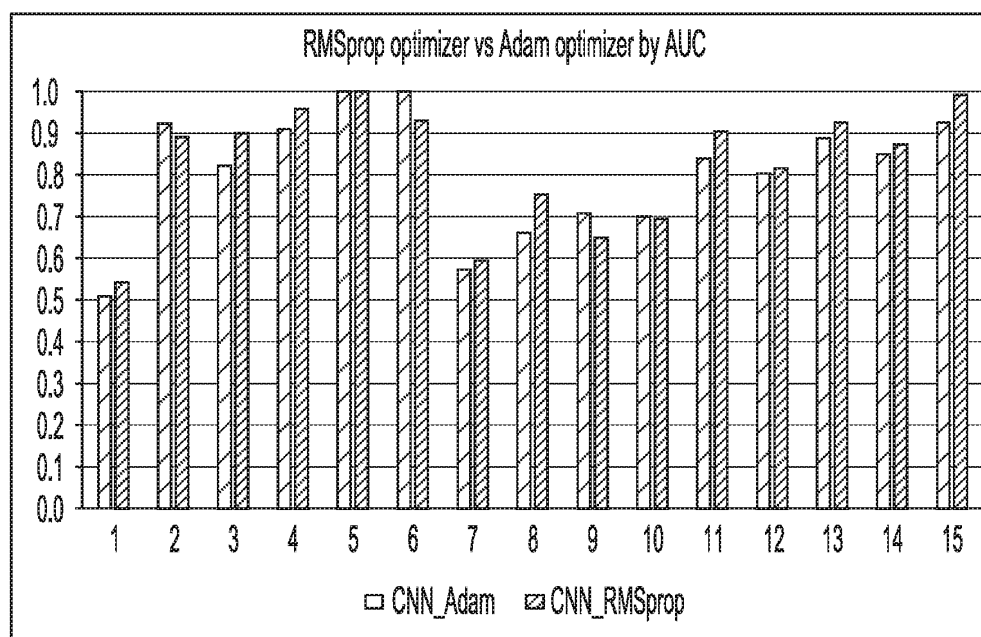


FIG. 16B

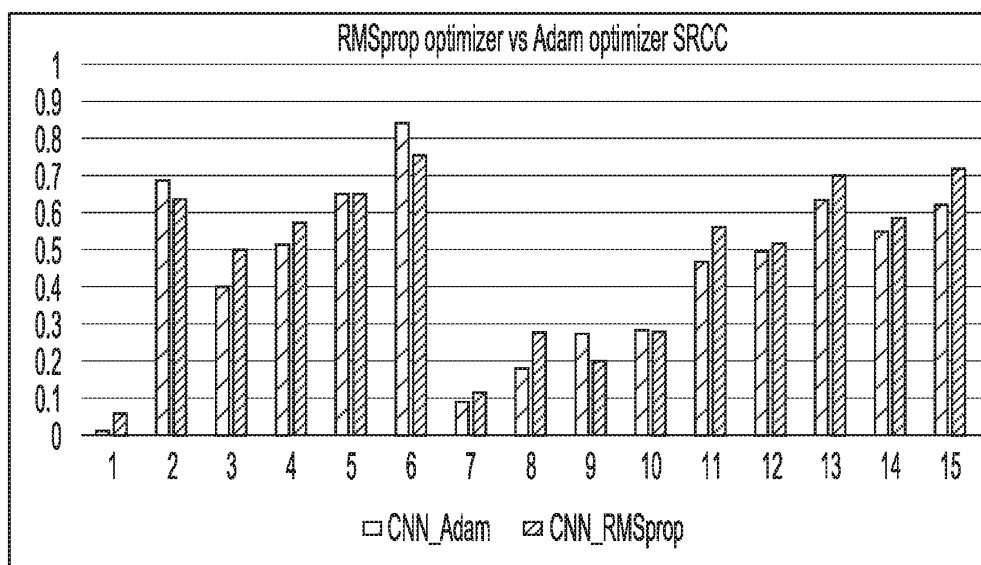


FIG. 16C

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IEDB	HLA	length	test_size	train_size	Ner	MHCpan	MHCflurry	CNN	GAN-CNN	fake positive + real positive + real negative	sNeubula	PSSM
1029824	A0201	9	77	10549		0.546	0.586	0.562	0.424	0.583	0.539	0.489
1028928	A0201	9	13	10549		0.955	0.955	0.955	0.909	1.000	0.909	0.955
1028790	A0201	9	55	10549		0.574	0.609	0.561	0.758	0.825	0.778	0.559
1028790	A0202	9	55	1706		0.713	0.758	0.664	0.793	0.812	0.680	0.704
1028790	A0203	9	55	2711		0.696	0.884	0.682	0.884	0.955	0.629	0.678
1028790	A0206	9	55	2195		0.770	0.775	0.822			0.848	0.769
1028790	A6802	9	55	2871		0.806	0.816	0.891			0.713	0.838
1028928	B0702	9	12	3640		1.000	1.000	1.000			0.900	1.000
315174	B2703	9	11	918		0.893	0.893	1.000			0.607	0.804
1029125	B2705	9	21	2439		0.959	0.949	0.898			0.959	0.959
1029061	B5701	9	26	2628		0.943	0.750	0.795			0.575	0.807
1028790	A0201	10	35	3187		0.677	0.685	0.742			0.704	0.605
1028790	A0203	10	35	1424		0.750	0.786	0.837			0.697	0.724
1028790	A0206	10	35	1430		0.768	0.808	0.942			0.680	0.768
1028790	A6802	10	35	1432		0.620	0.661	0.977			0.813	0.750

FIG.17