

Table 1: Classification results on benchmark datasets for the logistic regression classifier. F1 score averaged over 2 repeats of 5-fold (outer) cross-validation is reported. Best and second-best results are highlighted.

	Imbalanced	Random	Global	SMOTE	Border.	Safelevel	ADASYN	MWMOTE	DBSMOTE	LVQ	Simplicial	S-Border.	S-Safe.	S-ADASYN
ecoli	0.5418	0.6116	0.6249	0.6016	0.6266	0.6067	0.5897	0.6503	0.6809	0.5792	0.6530	0.6407	0.5998	0.6575
optical_digits	0.8434	0.7642	0.7921	0.7958	0.7559	0.7863	0.7518	0.7862	0.7702	0.8383	0.8147	0.7614	0.7960	0.7813
pen_digits	0.7917	0.7219	0.7398	0.7343	0.5640	0.7302	0.5671	0.7036	0.7404	0.7526	0.7436	0.5620	0.7369	0.6305
abalone	0.0150	0.3587	0.3629	0.3627	0.3758	0.3666	0.3577	0.3769	0.3676	0.3357	0.3748	0.3751	0.3737	0.3712
sick_euthyroid	0.6720	0.6103	0.6243	0.6317	0.6273	0.5821	0.6090	0.6310	0.7122	0.6933	0.7271	0.6952	0.6494	0.6990
spectrometer	0.8374	0.8440	0.8734	0.8502	0.8465	0.8319	0.8422	0.8502	0.8409	0.7429	0.8636	0.8452	0.8651	0.8341
car_eval_34	0.9125	0.8806	0.8844	0.8835	0.8842	0.7881	0.8828	0.8827	0.8734	0.8820	0.8917	0.8904	0.8891	0.8962
us_crime	0.5354	0.4674	0.4891	0.4922	0.5198	0.4875	0.4767	0.4877	0.4717	0.4781	0.4950	0.5195	0.5016	0.4989
yeast_ml8	0.0319	0.1395	0.1420	0.1398	0.1417	0.1442	0.1434	0.1483	0.1424	0.1280	0.1365	0.1421	0.1323	0.1386
scene	0.1934	0.2481	0.2456	0.2480	0.2427	0.2348	0.2426	0.2552	0.2241	0.2338	0.2334	0.2576	0.2298	0.2262
libras_move	0.8179	0.7357	0.7520	0.7710	0.7876	0.7128	0.7621	0.7448	0.7448	0.6710	0.8356	0.8254	0.7851	0.8135
thyroid_sick	0.6554	0.4822	0.5054	0.5059	0.5215	0.4234	0.4940	0.5109	0.6449	0.6393	0.6413	0.6641	0.6152	0.6537
coil_2000	0.0197	0.1988	0.2010	0.1931	0.1977	0.1929	0.1914	0.1999	0.1229	0.1860	0.2058	0.2091	0.2023	0.2033
solar_flare_m0	0.1122	0.2046	0.1979	0.1917	0.1986	0.2008	0.1904	0.1962	0.1253	0.1922	0.1923	0.1986	0.1966	0.1988
oil	0.5085	0.4536	0.4976	0.4639	0.4523	0.3881	0.4698	0.4559	0.4381	0.4371	0.4998	0.4900	0.4149	0.4856
car_eval_4	0.8469	0.8303	0.8485	0.8436	0.8462	0.7957	0.8485	0.8533	0.8269	0.8471	0.8589	0.8559	0.8549	0.8608
wine_quality	0.0892	0.1760	0.1818	0.1765	0.1814	0.1825	0.1772	0.1870	0.1801	0.1705	0.1788	0.1828	0.1793	0.1713
letter_img	0.7418	0.5540	0.5930	0.5786	0.5051	0.5646	0.5099	0.5656	0.6581	0.5958	0.6480	0.5175	0.6252	0.5574
yeast_me2	0.2066	0.2624	0.2631	0.2656	0.3049	0.2622	0.2538	0.2793	0.3381	0.2528	0.2799	0.3422	0.2699	0.2994
ozone_level	0.1970	0.2522	0.2703	0.2661	0.3028	0.2363	0.2624	0.2843	0.2495	0.2862	0.3077	0.3253	0.2791	0.3055
abalone_19	0.0000	0.0463	0.0471	0.0474	0.0556	0.0473	0.0473	0.0534	0.0408	0.0477	0.0580	0.0589	0.0602	0.0580
mean	0.4557	0.4687	0.4827	0.4782	0.4733	0.4555	0.4605	0.4811	0.4854	0.4757	0.5066	0.4933	0.4884	0.4924
rank	8.4286	9.8095	6.7857	8.0238	7.0952	9.7619	10.1190	6.2857	8.4048	9.4286	4.2381	4.3333	6.3810	5.9048

Table 2: Classification results on benchmark datasets for the decision tree classifier. F1 score averaged over 2 repeats of 5-fold (outer) cross-validation is reported. Best and second-best results are highlighted.

	Imbalanced	Random	Global	SMOTE	Border.	Safelevel	ADASYN	MWMOTE	DBSMOTE	LVQ	Simplicial	S-Border.	S-Safe.	S-ADASYN
ecoli	0.5481	0.5274	0.5399	0.5348	0.5373	0.5745	0.5370	0.5587	0.5552	0.5504	0.5338	0.5409	0.4964	0.5317
optical_digits	0.6309	0.5627	0.5551	0.5668	0.5365	0.5578	0.5212	0.5579	0.5632	0.5498	0.5581	0.5319	0.5616	0.5723
pen_digits	0.7525	0.6159	0.5578	0.6135	0.5468	0.6106	0.6731	0.5893	0.6068	0.5970	0.6266	0.5373	0.6284	0.6368
abalone	0.0000	0.3658	0.3719	0.3709	0.3703	0.3786	0.3670	0.3728	0.3774	0.3398	0.3785	0.3858	0.3747	0.3690
sick_euthyroid	0.8567	0.7613	0.8322	0.8283	0.8242	0.7445	0.8370	0.8369	0.8337	0.7466	0.8268	0.8350	0.7987	0.8362
spectrometer	0.6649	0.6088	0.5149	0.6025	0.5957	0.5954	0.5918	0.5435	0.6099	0.6458	0.6550	0.6080	0.6712	0.6225
car_eval_34	0.4483	0.3770	0.5174	0.4175	0.4140	0.4363	0.3948	0.4135	0.3652	0.3987	0.4552	0.4731	0.4552	0.4430
us_crime	0.3990	0.4131	0.4181	0.4293	0.4533	0.4349	0.4279	0.4088	0.4334	0.3425	0.4034	0.4407	0.4264	0.4222
yeast_ml8	0.0054	0.1305	0.1513	0.1460	0.1589	0.1462	0.1381	0.1513	0.1440	0.1140	0.1517	0.1514	0.1550	0.1467
scene	0.1492	0.2230	0.2024	0.2137	0.2085	0.2368	0.2061	0.2163	0.0554	0.0736	0.2002	0.2233	0.1903	0.1877
libras_move	0.3541	0.5478	0.6010	0.5739	0.5384	0.5055	0.5154	0.5756	0.6092	0.5819	0.5754	0.6357	0.5247	0.5050
thyroid_sick	0.8175	0.6487	0.7761	0.7014	0.7161	0.6142	0.6869	0.7379	0.8234	0.6612	0.7761	0.8049	0.7877	0.7760
coil_2000	0.0166	0.2127	0.1963	0.1796	0.1891	0.1922	0.1949	0.1970	0.0852	0.0220	0.1742	0.1875	0.1728	0.1743
solar_flare_m0	0.0845	0.1824	0.1989	0.1689	0.1684	0.1679	0.1647	0.1222	0.0836	0.1965	0.1561	0.1479	0.1321	0.0906
oil	0.4178	0.2609	0.3429	0.2850	0.3577	0.3184	0.2774	0.2500	0.3056	0.3310	0.3570	0.4499	0.2720	0.3987
car_eval_4	0.0000	0.4090	0.4132	0.4090	0.4090	0.4090	0.4090	0.4090	0.4090	0.3852	0.3922	0.4090	0.3922	0.3922
wine_quality	0.1498	0.2338	0.1424	0.1815	0.1641	0.1949	0.1377	0.1569	0.1388	0.2437	0.1664	0.1810	0.1670	0.1395
letter_img	0.6802	0.3643	0.5952	0.4351	0.3734	0.4373	0.3653	0.4305	0.6415	0.4674	0.6541	0.4270	0.5950	0.4592
yeast_me2	0.2514	0.2196	0.2218	0.2167	0.2648	0.2061	0.2095	0.2335	0.1096	0.2659	0.2349	0.2687	0.2330	0.2256
ozone_level	0.0190	0.1429	0.1481	0.1523	0.1871	0.1666	0.1582	0.1836	0.1579	0.1558	0.2076	0.1887	0.1888	0.2058
abalone_19	0.0000	0.0346	0.0227	0.0350	0.0608	0.0447	0.0357	0.0564	0.0425	0.0319	0.0328	0.0539	0.0413	0.0336
mean	0.3450	0.3734	0.3962	0.3839	0.3845	0.3796	0.3737	0.3810	0.3786	0.3667	0.4055	0.4039	0.3935	0.3890
rank	8.0952	8.7857	7.0476	7.5952	6.9762	7.1190	9.0238	7.2619	7.6905	8.9524	6.5476	5.1190	7.0714	7.7143

Table 3: Classification results on benchmark datasets for the SVM classifier with linear kernel. F1 score averaged over 5 repeats of 5-fold (outer) cross-validation is reported. **Best and **second-best** results are highlighted.**

	Imbalanced	Random	Global	SMOTE	Border.	Safelevel	ADASYN	MWMOTE	DBSMOTE	LVQ	Simplicial	S-Border.	S-Safe.	S-ADASYN
ecoli	0.5410	0.6193	0.6218	0.6295	0.6069	0.6076	0.6077	0.6364	0.6807	0.5803	0.6627	0.6311	0.5841	0.6452
optical_digits	0.8463	0.7664	0.7912	0.7910	0.7453	0.7881	0.7427	0.7881	0.7677	0.8350	0.8105	0.7501	0.7995	0.7799
pen_digits	0.7948	0.7251	0.7404	0.7344	0.5471	0.7330	0.5601	0.7029	0.7373	0.7484	0.7426	0.5480	0.7399	0.6201
abalone	0.0020	0.3492	0.3547	0.3562	0.3665	0.3595	0.3493	0.3692	0.3610	0.3322	0.3685	0.3696	0.3665	0.3639
sick_euthyroid	0.6923	0.5985	0.6183	0.6275	0.6229	0.5712	0.6016	0.6269	0.7030	0.6873	0.7084	0.6911	0.6478	0.6943
spectrometer	0.8199	0.7896	0.8118	0.7984	0.8106	0.8019	0.7969	0.7937	0.8165	0.6863	0.8239	0.8187	0.8177	0.8183
car_eval_34	0.9228	0.9083	0.9067	0.9050	0.9030	0.7982	0.9050	0.9048	0.9078	0.8781	0.9143	0.9088	0.9151	0.9120
us_crime	0.5121	0.4440	0.4631	0.4532	0.4871	0.4873	0.4412	0.4537	0.4487	0.4707	0.4887	0.4857	0.4669	0.4762
yeast_ml8	0.0022	0.1433	0.1441	0.1403	0.1435	0.1432	0.1354	0.1445	0.1471	0.1281	0.1397	0.1434	0.1392	0.1387
scene	0.1962	0.2222	0.2282	0.2249	0.2308	0.2363	0.2241	0.2262	0.1970	0.2145	0.2243	0.2369	0.2184	0.2173
libras_move	0.7765	0.7342	0.7396	0.7455	0.7507	0.7352	0.7415	0.7318	0.7259	0.7182	0.7776	0.7609	0.7497	0.7721
thyroid_sick	0.6130	0.4598	0.4800	0.4941	0.5178	0.4161	0.4768	0.4960	0.6318	0.6330	0.6553	0.6738	0.6054	0.6604
coil_2000	0.0094	0.1985	0.2003	0.1952	0.1994	0.1926	0.1926	0.1974	0.1013	0.1908	0.2086	0.2219	0.2039	0.2040
solar_flare_m0	0.0100	0.1972	0.1999	0.1885	0.1920	0.1917	0.1895	0.1879	0.0965	0.2096	0.1874	0.1872	0.1920	0.1814
oil	0.5539	0.4606	0.4862	0.4772	0.5097	0.4051	0.4614	0.4647	0.4492	0.4667	0.5277	0.5454	0.4611	0.5142
car_eval_4	0.8559	0.8348	0.8479	0.8459	0.8450	0.8067	0.8459	0.8562	0.8348	0.8359	0.8677	0.8665	0.8729	0.8721
wine_quality	0.0043	0.1794	0.1840	0.1769	0.1849	0.1808	0.1787	0.1875	0.1786	0.1784	0.1852	0.1846	0.1806	0.1728
letter_img	0.7445	0.5517	0.5913	0.5714	0.4991	0.5595	0.5005	0.5590	0.6423	0.5795	0.6230	0.5148	0.6168	0.5442
yeast_me2	0.0274	0.2646	0.2698	0.2735	0.3084	0.2665	0.2624	0.2875	0.3439	0.2582	0.3115	0.3653	0.2750	0.2946
ozone_level	0.0998	0.2467	0.2603	0.2598	0.2813	0.2218	0.2503	0.2622	0.2426	0.2674	0.2874	0.3058	0.2659	0.2847
abalone_19	0.0000	0.0474	0.0487	0.0509	0.0491	0.0432	0.0496	0.0501	0.0450	0.0513	0.0537	0.0527	0.0546	0.0538
mean	0.4297	0.4638	0.4756	0.4733	0.4667	0.4546	0.4530	0.4727	0.4790	0.4738	0.5033	0.4887	0.4844	0.4867
rank	7.9048	9.9762	6.9048	8.2143	7.4286	9.5714	10.4524	7.3810	8.2143	8.8095	3.2857	4.7619	6.0000	6.0952

Table 4: Classification results on benchmark datasets for the SVM classifier with RBF kernel. F1 score averaged over 5 repeats of 5-fold (outer) cross-validation is reported. **Best and **second-best** results are highlighted.**

	Imbalanced	Random	Global	SMOTE	Border.	Safelevel	ADASYN	MWMOTE	DBSMOTE	LVQ	Simplicial	S-Border.	S-Safe.	S-ADASYN
ecoli	0.6238	0.6033	0.6294	0.6284	0.6130	0.6025	0.5989	0.6148	0.6661	0.5995	0.6794	0.6513	0.6390	0.6817
optical_digits	0.9597	0.9741	0.9766	0.9761	0.9691	0.9755	0.9731	0.9749	0.9753	0.9285	0.9752	0.9711	0.9743	0.9740
pen_digits	0.9918	0.9936	0.9916	0.9935	0.9908	0.9938	0.9902	0.9932	0.9925	0.9915	0.9934	0.9905	0.9938	0.9916
abalone	0.0000	0.3810	0.4212	0.3883	0.3880	0.3880	0.3783	0.3892	0.3890	0.3583	0.4029	0.4037	0.3948	0.3913
sick_euthyroid	0.1727	0.6027	0.6524	0.6230	0.6069	0.5785	0.6067	0.6175	0.6347	0.6625	0.6614	0.6469	0.6425	0.6486
spectrometer	0.8474	0.8130	0.8263	0.8205	0.8171	0.8196	0.8211	0.8175	0.8595	0.8582	0.8467	0.8227	0.8419	0.8571
car_eval_34	0.8853	0.9372	0.9436	0.9425	0.9411	0.8958	0.9437	0.9457	0.9372	0.9143	0.9414	0.9465	0.9468	0.9450
us_crime	0.3589	0.5066	0.4923	0.4818	0.5016	0.5265	0.4657	0.4730	0.5099	0.5412	0.4727	0.4974	0.4611	0.4669
yeast_ml8	0.0000	0.0319	0.0044	0.0085	0.0065	0.0761	0.0022	0.0000	0.0319	0.0168	0.0000	0.0022	0.0000	0.0000
scene	0.0175	0.2866	0.2724	0.2674	0.2711	0.2649	0.2655	0.2556	0.0261	0.2090	0.2599	0.2654	0.2199	0.2587
libras_move	0.8148	0.8174	0.8030	0.8063	0.8465	0.7280	0.8133	0.8227	0.8174	0.7913	0.8289	0.8271	0.8189	0.8465
thyroid_sick	0.0648	0.5457	0.5880	0.5769	0.5717	0.4731	0.5606	0.5754	0.5517	0.5488	0.6443	0.6395	0.6384	0.6459
coil_2000	0.0000	0.1934	0.1869	0.1844	0.1845	0.1808	0.1815	0.1814	0.0154	0.1323	0.1773	0.1765	0.1723	0.1761
solar_flare_m0	0.0000	0.1673	0.1643	0.1614	0.1482	0.1642	0.1625	0.1407	0.0290	0.2409	0.1465	0.1370	0.1384	0.1438
oil	0.3702	0.4438	0.4752	0.4475	0.4825	0.4193	0.4421	0.4601	0.4447	0.4975	0.4712	0.5242	0.4354	0.4258
car_eval_4	0.9677	0.9557	0.9597	0.9583	0.9583	0.8976	0.9583	0.9597	0.9557	0.8887	0.9652	0.9637	0.9624	0.9667
wine_quality	0.0352	0.2425	0.1959	0.2411	0.2538	0.2369	0.2321	0.2128	0.1430	0.2616	0.2408	0.2533	0.2406	0.2365
letter_img	0.9522	0.9452	0.9369	0.9559	0.9548	0.9480	0.9569	0.9602	0.9382	0.9521	0.9637	0.9555	0.9626	0.9659
yeast_me2	0.0139	0.2816	0.2872	0.2947	0.3559	0.2672	0.2881	0.3085	0.3485	0.3095	0.3585	0.4163	0.3137	0.3493
ozone_level	0.0000	0.3095	0.2908	0.2956	0.3150	0.2465	0.2955	0.3024	0.3103	0.3489	0.3250	0.3306	0.3169	0.3250
abalone_19	0.0000	0.0444	0.0553	0.0503	0.0474	0.0381	0.0500	0.0497	0.0293	0.0484	0.0555	0.0492	0.0613	0.0541
mean	0.3846	0.5274	0.5311	0.5287	0.5345	0.5105	0.5232	0.5264	0.5050	0.5286	0.5433	0.5462	0.5321	0.5405
rank	11.7143	7.9524	6.3571	6.7143	7.1429	9.1905	9.0952	7.6905	8.1905	7.8095	4.9524	5.6667	6.5238	6.0000