TABLE 1
Comparison Results (Mean±Std. Deviation) Between the Proposed Algorithms and the Variants without Considering Label-specific Features

Data set	Hamming loss↓				Ranking loss↓			
	GRROfast	GRROfast$_o$	GRRO	GRRO$_o$	GRROfast	GRROfast$_o$	GRRO	GRRO$_o$
Bibtex	**0.0136±0.0004**	0.0138±0.0003	**0.0136±0.0004**	0.0137±0.0003	**0.2006±0.0349**	0.2074±0.0335	**0.1986±0.0334**	0.2060±0.0343
Birds	0.0581±0.0023	**0.0549±0.0060**	0.0551±0.0025	**0.0537±0.0038**	0.1301±0.0120	**0.1241±0.0067**	0.1284±0.0145	**0.1265±0.0085**
Chemistry	**0.0121±0.0001**	**0.0121±0.0000**	**0.0121±0.0000**	**0.0121±0.0000**	**0.1542±0.0082**	0.1546±0.0079	**0.1540±0.0077**	0.1549±0.0071
Chess	**0.0100±0.0001**	**0.0100±0.0001**	**0.0100±0.0001**	0.0101±0.0001	**0.1459±0.0081**	0.1490±0.0072	**0.1441±0.0083**	0.1470±0.0071
Coffee	**0.0161±0.0003**	0.0159±0.0003	**0.0158±0.0002**	0.0159±0.0004	**0.1564±0.0142**	0.1630±0.0138	**0.1627±0.0110**	0.1646±0.0140
Cooking	**0.0052±0.0001**	0.0053±0.0001	**0.0052±0.0001**	**0.0052±0.0001**	**0.1850±0.0161**	0.1857±0.0163	**0.1836±0.0156**	0.1852±0.0159
Cs	**0.0088±0.0001**	**0.0088±0.0001**	**0.0088±0.0001**	**0.0088±0.0001**	**0.1477±0.0100**	0.1500±0.0089	**0.1457±0.0117**	0.1492±0.0097
Philosophy	**0.0091±0.0001**	**0.0091±0.0001**	**0.0091±0.0001**	**0.0091±0.0001**	**0.1399±0.0057**	0.1419±0.0052	**0.1383±0.0067**	0.1403±0.0060
Corel5k	**0.0095±0.0000**	**0.0095±0.0000**	**0.0094±0.0000**	0.0095±0.0000	**0.1370±0.0036**	0.1376±0.0030	**0.1358±0.0038**	0.1376±0.0030
Corel16k001	**0.0188±0.0000**	**0.0188±0.0000**	**0.0188±0.0000**	**0.0188±0.0000**	**0.1864±0.0026**	0.1867±0.0024	**0.1864±0.0026**	0.1867±0.0024
Corel16k002	**0.0174±0.0000**	**0.0174±0.0000**	**0.0174±0.0000**	**0.0174±0.0000**	**0.1846±0.0023**	**0.1841±0.0026**	0.1844±0.0025	**0.1840±0.0027**
Genbase	0.0067±0.0077	**0.0066±0.0078**	0.0069±0.0077	0.0070±0.0076	**0.0153±0.0216**	0.0154±0.0215	**0.0149±0.0206**	0.0152±0.0208
Langlog	**0.0156±0.0002**	**0.0156±0.0001**	**0.0156±0.0001**	**0.0156±0.0001**	**0.1545±0.0083**	0.1573±0.0069	**0.1578±0.0065**	0.1559±0.0070
Medical	**0.0142±0.0022**	**0.0142±0.0022**	**0.0138±0.0025**	0.0142±0.0022	0.0573±0.0191	**0.0572±0.0189**	**0.0571±0.0189**	0.0572±0.0189
Slashdot	**0.0486±0.0010**	0.0492±0.0008	**0.0486±0.0011**	0.0490±0.0008	**0.1792±0.0096**	**0.1792±0.0100**	**0.1769±0.0086**	0.1776±0.0084
Yeast	**0.2093±0.0094**	**0.2093±0.0096**	0.2086±0.0103	**0.2082±0.0093**	0.1837±0.0089	**0.1834±0.0092**	**0.1834±0.0085**	**0.1834±0.0086**
Arts	**0.0587±0.0010**	0.0590±0.0008	**0.0586±0.0011**	0.0589±0.0008	**0.1515±0.0085**	0.1531±0.0076	**0.1514±0.0087**	0.1529±0.0074
Business	**0.0274±0.0005**	0.0275±0.0005	**0.0274±0.0005**	**0.0274±0.0005**	**0.0417±0.0018**	**0.0416±0.0020**	0.0423±0.0015	**0.0417±0.0019**
Entertainment	**0.0585±0.0024**	0.0590±0.0024	**0.0585±0.0024**	0.0590±0.0025	**0.1224±0.0087**	0.1240±0.0078	**0.1222±0.0094**	0.1244±0.0077
Health	**0.0405±0.0017**	0.0406±0.0019	**0.0403±0.0019**	0.0404±0.0020	**0.0599±0.0061**	**0.0599±0.0064**	**0.0594±0.0065**	0.0595±0.0065
Recreation	0.0574±0.0014	**0.0573±0.0014**	**0.0572±0.0015**	0.0574±0.0014	**0.1709±0.0138**	0.1718±0.0138	**0.1692±0.0149**	0.1713±0.0141
Reference	0.0286±0.0009	**0.0284±0.0009**	0.0286±0.0008	**0.0285±0.0008**	**0.0894±0.0064**	0.0907±0.0065	**0.0894±0.0065**	0.0911±0.0065
Science	**0.0336±0.0005**	0.0337±0.0004	**0.0336±0.0005**	0.0337±0.0004	**0.1346±0.0071**	0.1372±0.0065	**0.1323±0.0076**	0.1355±0.0060
Social	0.0243±0.0014	**0.0237±0.0017**	0.0245±0.0015	**0.0240±0.0018**	**0.0673±0.0053**	0.0694±0.0038	**0.0670±0.0050**	0.0692±0.0040

Data set	Coverage↓				Average precision↑			
	GRROfast	GRROfast$_o$	GRRO	GRRO$_o$	GRROfast	GRROfast$_o$	GRRO	GRRO$_o$
Bibtex	**0.3166±0.0434**	0.3269±0.0409	**0.3128±0.0424**	0.3248±0.0422	**0.3569±0.0697**	0.3351±0.0718	**0.3526±0.0633**	0.3371±0.0758
Birds	0.1826±0.0156	**0.1758±0.0082**	0.1831±0.0185	**0.1805±0.0102**	0.6720±0.0161	**0.6924±0.0237**	0.6910±0.0253	**0.6981±0.0262**
Chemistry	**0.2552±0.0094**	0.2558±0.0087	**0.2551±0.0091**	0.2563±0.0079	**0.2947±0.0252**	0.2925±0.0228	**0.2971±0.0238**	0.2927±0.0230
Chess	**0.2724±0.0103**	0.2754±0.0098	**0.2694±0.0106**	0.2743±0.0090	**0.3275±0.0394**	0.3116±0.0328	**0.3325±0.0392**	0.3241±0.0335
Coffee	**0.2598±0.0143**	0.2630±0.0157	**0.2667±0.0074**	0.2695±0.0155	**0.3613±0.0438**	0.3480±0.0355	**0.3671±0.0436**	0.3625±0.0423
Cooking	**0.3096±0.0187**	0.3105±0.0193	**0.3082±0.0181**	0.3102±0.0188	**0.2626±0.0618**	0.2533±0.0617	**0.2659±0.0604**	0.2603±0.0633
Cs	**0.2708±0.0135**	0.2740±0.0126	**0.2684±0.0154**	0.2732±0.0134	**0.3211±0.0324**	0.3138±0.0285	**0.3263±0.0352**	0.3156±0.0289
Philosophy	**0.2498±0.0067**	0.2522±0.0058	**0.2474±0.0081**	0.2500±0.0068	**0.3355±0.0335**	0.3159±0.0273	**0.3366±0.0341**	0.3262±0.0291
Corel5k	**0.3155±0.0042**	0.3157±0.0041	**0.3128±0.0048**	0.3160±0.0036	**0.2374±0.0101**	0.2303±0.0067	**0.2425±0.0116**	0.2336±0.0078
Corel16k001	**0.3565±0.0033**	0.3574±0.0031	**0.3565±0.0033**	0.3574±0.0031	**0.2597±0.0052**	0.2592±0.0046	**0.2597±0.0052**	0.2591±0.0046
Corel16k002	0.3549±0.0033	**0.3536±0.0041**	0.3544±0.0037	**0.3534±0.0044**	**0.2501±0.0042**	**0.2501±0.0046**	**0.2501±0.0042**	0.2499±0.0044
Genbase	**0.0297±0.0224**	0.0298±0.0224	**0.0294±0.0214**	0.0296±0.0216	**0.9527±0.0991**	0.9526±0.0990	**0.9525±0.0940**	0.9517±0.0956
Langlog	**0.1594±0.0077**	0.1630±0.0057	0.1632±0.0065	**0.1617±0.0058**	**0.3132±0.0285**	0.3035±0.0297	0.3038±0.0224	**0.3095±0.0286**
Medical	0.0804±0.0206	**0.0803±0.0206**	**0.0799±0.0205**	0.0803±0.0206	**0.7950±0.0857**	0.7917±0.0826	**0.7998±0.0878**	0.7920±0.0827
Slashdot	0.1954±0.0086	**0.1949±0.0093**	**0.1930±0.0080**	0.1934±0.0078	**0.4746±0.0285**	0.4732±0.0267	**0.4767±0.0291**	**0.4767±0.0272**
Yeast	0.4702±0.0111	**0.4701±0.0114**	**0.4690±0.0099**	0.4696±0.0101	**0.7426±0.0122**	0.7424±0.0123	**0.7435±0.0123**	0.7432±0.0120
Arts	**0.2103±0.0082**	0.2115±0.0103	**0.2101±0.0084**	0.2115±0.0071	**0.5142±0.0239**	0.5103±0.0221	**0.5151±0.0247**	0.5106±0.0210
Business	0.0777±0.0023	**0.0774±0.0025**	0.0782±0.0019	**0.0775±0.0025**	**0.8743±0.0041**	0.8740±0.0042	0.8736±0.0036	**0.8739±0.0042**
Entertainment	**0.1584±0.0090**	0.1602±0.0082	**0.1577±0.0100**	0.1608±0.0079	**0.5730±0.0313**	0.5728±0.0328	**0.5755±0.0345**	0.5713±0.0329
Health	**0.1031±0.0073**	**0.1031±0.0075**	**0.1025±0.0079**	**0.1025±0.0077**	0.7094±0.0195	**0.7116±0.0224**	0.7118±0.0225	**0.7135±0.0231**
Recreation	**0.2131±0.0140**	0.2140±0.0139	**0.2116±0.0150**	0.2137±0.0141	**0.5326±0.0353**	0.5302±0.0347	**0.5368±0.0377**	0.5303±0.0351
Reference	**0.1048±0.0063**	0.1061±0.0065	**0.1047±0.0065**	0.1064±0.0064	**0.6231±0.0242**	0.6224±0.0223	**0.6207±0.0232**	0.6198±0.0223
Science	**0.1706±0.0075**	0.1735±0.0066	**0.1684±0.0081**	0.1716±0.0060	**0.4852±0.0199**	0.4790±0.0186	**0.4873±0.0218**	0.4747±0.0167
Social	**0.0923±0.0059**	0.0950±0.0035	**0.0919±0.0056**	0.0947±0.0039	**0.7166±0.0160**	0.7118±0.0145	**0.7168±0.0174**	0.7124±0.0150

Data set	Macro-F1↑				Micro-F1↑			
	GRROfast	GRROfast$_o$	GRRO	GRRO$_o$	GRROfast	GRROfast$_o$	GRRO	GRRO$_o$
Bibtex	**0.0538±0.0335**	0.0499±0.0280	**0.0545±0.0332**	0.0495±0.0283	**0.2214±0.0689**	0.2151±0.0595	**0.2205±0.0715**	0.2165±0.0601
Birds	0.1025±0.0210	**0.1314±0.0316**	0.1222±0.0246	**0.1318±0.0236**	0.4350±0.0588	**0.4784±0.0713**	0.4890±0.0322	**0.5045±0.0344**
Chemistry	**0.0103±0.0066**	0.0093±0.0060	**0.0117±0.0060**	0.0103±0.0060	**0.0439±0.0233**	0.0411±0.0207	**0.0508±0.0236**	0.0456±0.0230
Chess	**0.0211±0.0095**	0.0152±0.0058	**0.0209±0.0081**	0.0167±0.0058	**0.1874±0.0364**	0.1704±0.0284	**0.1887±0.0257**	0.1704±0.0247
Coffee	0.4925±0.0035	**0.4946±0.0052**	**0.4973±0.0047**	0.4947±0.0063	0.0294±0.0190	**0.0375±0.0237**	0.0435±0.0233	**0.0454±0.0357**
Cooking	**0.0285±0.0152**	0.0247±0.0138	**0.0283±0.0147**	0.0258±0.0147	**0.1679±0.0563**	0.1527±0.0557	**0.1699±0.0575**	0.1585±0.0601
Cs	**0.0263±0.0106**	0.0222±0.0086	**0.0286±0.0116**	0.0229±0.0086	**0.1469±0.0370**	0.1405±0.0362	**0.1564±0.0419**	0.1410±0.0320
Philosophy	**0.0275±0.0097**	0.0173±0.0058	**0.0298±0.0107**	0.0224±0.0072	**0.1795±0.0269**	0.1561±0.0213	**0.1825±0.0361**	0.1694±0.0235
Corel5k	**0.2994±0.0015**	0.2985±0.0012	**0.3010±0.0024**	0.2979±0.0015	**0.0103±0.0058**	0.0064±0.0043	**0.0170±0.0095**	0.0064±0.0041
Corel16k001	**0.0035±0.0016**	0.0020±0.0013	**0.0035±0.0016**	0.0021±0.0013	**0.0072±0.0045**	0.0053±0.0038	**0.0072±0.0045**	0.0052±0.0038
Corel16k002	0.0048±0.0013	**0.0048±0.0014**	**0.0050±0.0015**	0.0049±0.0014	0.0085±0.0033	**0.0089±0.0039**	**0.0095±0.0035**	0.0089±0.0036
Genbase	0.5856±0.1372	**0.5894±0.1407**	0.5803±0.1446	**0.5858±0.1435**	0.9093±0.1317	**0.9100±0.1319**	0.9066±0.1290	0.9065±0.1285
Langlog	0.1200±0.0042	**0.1202±0.0041**	0.1178±0.0030	**0.1199±0.0027**	0.0896±0.0168	**0.0928±0.0199**	0.0782±0.0175	**0.0973±0.0169**
Medical	**0.3596±0.0590**	0.3522±0.0574	**0.3520±0.0573**	0.3516±0.0596	0.7038±0.0760	0.7029±0.0708	**0.7117±0.0771**	0.7022±0.0707
Slashdot	**0.2193±0.0323**	0.2151±0.0298	**0.2254±0.0318**	0.2193±0.0272	**0.2347±0.0488**	0.2236±0.0439	**0.2330±0.0492**	0.2276±0.0423
Yeast	**0.3244±0.0478**	0.3236±0.0469	**0.3220±0.0472**	0.3205±0.0473	**0.6044±0.0325**	**0.6044±0.0323**	**0.6054±0.0349**	**0.6059±0.0340**
Arts	**0.0778±0.0215**	0.0772±0.0192	**0.0759±0.0212**	0.0777±0.0191	**0.1987±0.0447**	0.1969±0.0390	**0.1996±0.0468**	0.1967±0.0381
Business	0.1548±0.0153	**0.1556±0.0152**	0.1533±0.0137	**0.1556±0.0162**	**0.6915±0.0092**	0.6912±0.0089	**0.6907±0.0086**	0.6905±0.0087
Entertainment	**0.1249±0.0403**	0.1097±0.0343	**0.1227±0.0399**	0.1102±0.0363	**0.2965±0.0809**	0.2848±0.0839	**0.2931±0.0773**	0.2866±0.0858
Health	**0.2170±0.0297**	0.2135±0.0289	**0.2280±0.0330**	0.2237±0.0345	0.4930±0.0290	**0.5066±0.0325**	0.5123±0.0245	**0.5167±0.0242**
Recreation	**0.1345±0.0338**	0.1302±0.0319	**0.1371±0.0356**	0.1297±0.0316	**0.2689±0.0534**	0.2676±0.0530	**0.2713±0.0552**	0.2671±0.0532
Reference	0.1208±0.0173	**0.1248±0.0173**	0.1220±0.0177	**0.1236±0.0181**	0.3854±0.0459	**0.3874±0.0385**	**0.3830±0.0421**	0.3796±0.0353
Science	**0.0590±0.0139**	0.0546±0.0135	**0.0604±0.0143**	0.0534±0.0116	**0.1816±0.0359**	0.1725±0.0330	**0.1830±0.0423**	0.1659±0.0346
Social	**0.1284±0.0243**	0.1160±0.0160	**0.1317±0.0220**	0.1190±0.0180	**0.5118±0.0633**	0.5002±0.0537	**0.5152±0.0627**	0.5040±0.0550