Additional material for:
A Role Mining technique based on Bag of Words model

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Contents

1 Dataset Americas Large

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	61205	578	4540	56087	253086
PUCC_C	481679	2850	8717	470112	12694663
CRM	52115	590	8242	43283	1299275
upa_len_first	61205	578	4540	56087	262647
upa_len_rnd	87615	725	4810	82080	394149
upa_len_idf	65733	601	4618	60514	291748
upa_idf_first	61895	580	4466	56849	6449014
upa_idf_rnd	87475	721	4533	82221	7474224
upa_idf_idf	66191	602	4475	61114	6638608
uncupa_len_first	63519	589	4536	58394	2934591
uncupa_len_rnd	88891	735	4728	83428	3350529
uncupa_len_idf	59962	573	4505	54884	2608363
uncupa_idf_first	63719	589	4463	58667	8475085
uncupa_idf_rnd	87819	727	4675	82417	10607938
uncupa_idf_idf	64138	597	4444	59097	8808885

Table 1: Results for dataset Americas large with mpr = 183

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	73922	495	4220	69207	277180
PUCC_C	445757	1500	5594	438663	6415926
CRM	74744	454	5004	69286	1889871
upa_len_first	73922	495	4220	69207	261213
upa_len_rnd	90828	539	4254	86035	342996
upa_len_idf	78431	508	4188	73735	281533
upa_idf_first	75094	495	4142	70457	5813976
upa_idf_rnd	90523	538	4176	85809	6115309
upa_idf_idf	78263	504	4100	73659	5797129
uncupa_len_first	74847	499	4260	70088	2333381
uncupa_len_rnd	90284	538	4341	85405	2490409
uncupa_len_idf	74308	495	4239	69574	2351386
uncupa_idf_first	76888	502	4195	72191	7989468
uncupa_idf_rnd	89918	540	4392	84986	8497078
uncupa_idf_idf	75995	500	4177	71318	7855365

Table 2: Results for dataset Americas large with mpr = 366

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	91071	434	4030	86607	286200
PUCC_C	233518	687	4052	228779	3072580
CRM	86870	419	4090	82361	4876172
upa_len_first	91071	434	4030	86607	282735
upa_len_rnd	93111	440	4049	88622	299004
upa_len_idf	91060	435	4025	86600	389139
upa_idf_first	90886	432	3959	86495	5266115
upa_idf_rnd	92904	438	3969	88497	5327772
upa_idf_idf	90875	433	3954	86488	5287785
uncupa_len_first	91610	438	4147	87025	2142261
uncupa_len_rnd	93750	442	4149	89159	2245548
uncupa_len_idf	89448	435	4129	84884	2165626
uncupa_idf_first	90970	437	4066	86467	7345934
uncupa_idf_rnd	92924	440	4075	88409	7388266
uncupa_idf_idf	91048	438	4044	86566	7393976

Table 3: Results for dataset Americas large with mpr = 549

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	93255	415	3974	88866	280812
PUCC_C	101675	422	3714	97539	1848119
CRM	91677	415	4132	87130	6302146
upa_len_first	93255	415	3974	88866	279809
upa_len_rnd	93255	415	3974	88866	284289
upa_len_idf	93255	415	3974	88866	280876
upa_idf_first	93070	413	3903	88754	5253128
upa_idf_rnd	93070	413	3903	88754	5258241
upa_idf_idf	93070	413	3903	88754	5628945
uncupa_len_first	93294	415	4075	88804	2114611
uncupa_len_rnd	93294	415	4075	88804	2108720
uncupa_len_idf	93294	415	4075	88804	2121988
uncupa_idf_first	93206	415	4007	88784	7180123
uncupa_idf_rnd	93206	415	4007	88784	7152089
uncupa_idf_idf	93206	415	4007	88784	7217057

Table 4: Results for dataset Americas large with mpr = 733

2 Dataset Americas Small

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	11211	204	7051	3956	94704
PUCC_C	50338	658	7799	41881	716883
CRM	11128	210	7769	3149	439395
upa_len_first	11211	204	7051	3956	98388
upa_len_rnd	11192	203	7052	3937	97368
upa_len_idf	11132	203	7048	3881	92654
upa_idf_first	11193	204	7127	3862	954296
upa_idf_rnd	11114	203	7120	3791	940547
upa_idf_idf	11114	203	7124	3787	938681
uncupa_len_first	10790	223	6553	4014	260912
uncupa_len_rnd	10869	224	6551	4094	260888
uncupa_len_idf	10584	220	6546	3818	270238
uncupa_idf_first	10525	222	6452	3851	850687
uncupa_idf_rnd	10681	224	6452	4005	834705
uncupa_idf_idf	10396	220	6447	3729	806580

Table 5: Results for dataset Americas small with mpr = 77

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	11200	196	7024	3980	96988
PUCC_C	41402	383	4642	36377	469768
CRM	11414	205	7947	3262	857212
upa_len_first	11200	196	7024	3980	95149
upa_len_rnd	11200	196	7024	3980	96532
upa_len_idf	11200	196	7024	3980	95732
upa_idf_first	11164	196	7100	3868	944692
upa_idf_rnd	11164	196	7100	3868	945232
upa_idf_idf	11164	196	7100	3868	969847
uncupa_len_first	10869	215	6528	4126	261072
uncupa_len_rnd	10869	215	6528	4126	261369
uncupa_len_idf	10713	214	6528	3971	262587
uncupa_idf_first	10688	217	6434	4037	815140
uncupa_idf_rnd	10688	217	6434	4037	809768
uncupa_idf_idf	10532	216	6434	3882	909963

Table 6: Results for dataset Americas small with mpr = 155

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	11200	196	7024	3980	93866
PUCC_C	19943	227	4321	15395	211346
CRM	11412	204	7946	3262	965073
upa_len_first	11200	196	7024	3980	94356
upa_len_rnd	11200	196	7024	3980	95655
upa_len_idf	11200	196	7024	3980	93758
upa_idf_first	11164	196	7100	3868	942302
upa_idf_rnd	11164	196	7100	3868	972353
upa_idf_idf	11164	196	7100	3868	941410
uncupa_len_first	10865	213	6526	4126	257824
uncupa_len_rnd	10865	213	6526	4126	253315
uncupa_len_idf	10865	213	6526	4126	261862
uncupa_idf_first	10684	215	6432	4037	801059
uncupa_idf_rnd	10684	215	6432	4037	812131
uncupa_idf_idf	10684	215	6432	4037	809498

Table 7: Results for dataset Americas small with mpr = 232

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	11200	196	7024	3980	95153
PUCC_C	15342	206	4298	10838	173480
CRM	11412	204	7946	3262	980398
upa_len_first	11200	196	7024	3980	95507
upa_len_rnd	11200	196	7024	3980	97950
upa_len_idf	11200	196	7024	3980	92770
upa_idf_first	11164	196	7100	3868	928641
upa_idf_rnd	11164	196	7100	3868	942964
upa_idf_idf	11164	196	7100	3868	938877
uncupa_len_first	10862	212	6524	4126	256084
uncupa_len_rnd	10862	212	6524	4126	257662
uncupa_len_idf	10862	212	6524	4126	256028
uncupa_idf_first	10681	214	6430	4037	809482
uncupa_idf_rnd	10681	214	6430	4037	799389
uncupa_idf_idf	10681	214	6430	4037	807421

Table 8: Results for dataset Americas small with mpr = 310

3 Dataset Apj

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	5193	469	3327	1397	151904
PUCC_C	8887	699	2889	5299	251329
CRM	5239	471	3400	1368	8853625
upa_len_first	5193	469	3327	1397	152453
upa_len_rnd	5193	469	3328	1396	153982
upa_len_idf	5193	469	3327	1397	152578
upa_idf_first	5181	469	3318	1394	515118
upa_idf_rnd	5181	469	3318	1394	516464
upa_idf_idf	5181	469	3318	1394	512575
uncupa_len_first	5078	470	3215	1393	388171
uncupa_len_rnd	5078	470	3215	1393	388937
uncupa_len_idf	5078	470	3215	1393	386843
uncupa_idf_first	5076	470	3213	1393	669912
uncupa_idf_rnd	5076	470	3213	1393	669867
uncupa_idf_idf	5076	470	3213	1393	672476

Table 9: Results for dataset Apj with mpr = 14

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	5165	456	3312	1397	150246
PUCC_C	5845	481	2353	3011	173912
CRM	5207	455	3371	1381	9396515
upa_len_first	5165	456	3312	1397	151470
upa_len_rnd	5165	456	3312	1397	151685
upa_len_idf	5165	456	3312	1397	152662
upa_idf_first	5153	456	3303	1394	512655
upa_idf_rnd	5153	456	3303	1394	514466
upa_idf_idf	5153	456	3303	1394	513930
uncupa_len_first	5050	457	3200	1393	389216
uncupa_len_rnd	5050	457	3200	1393	385619
uncupa_len_idf	5050	457	3200	1393	387219
uncupa_idf_first	5048	457	3198	1393	671047
uncupa_idf_rnd	5048	457	3198	1393	670755
uncupa_idf_idf	5048	457	3198	1393	667501

Table 10: Results for dataset Apj with mpr = 29

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	5160	454	3309	1397	158302
PUCC_C	5307	459	2328	2520	135460
CRM	5214	454	3368	1392	9793985
upa_len_first	5160	454	3309	1397	152746
upa_len_rnd	5160	454	3309	1397	152831
upa_len_idf	5160	454	3309	1397	153346
upa_idf_first	5148	454	3300	1394	512141
upa_idf_rnd	5148	454	3300	1394	514939
upa_idf_idf	5148	454	3300	1394	513775
uncupa_len_first	5045	455	3197	1393	386979
uncupa_len_rnd	5045	455	3197	1393	387280
uncupa_len_idf	5045	455	3197	1393	385527
uncupa_idf_first	5043	455	3195	1393	665363
uncupa_idf_rnd	5043	455	3195	1393	663755
uncupa_idf_idf	5043	455	3195	1393	667497

Table 11: Results for dataset Apj with mpr = 43

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	5160	454	3309	1397	150774
PUCC_C	5222	456	2324	2442	130010
CRM	5214	454	3368	1392	9612129
upa_len_first	5160	454	3309	1397	171253
upa_len_rnd	5160	454	3309	1397	183277
upa_len_idf	5160	454	3309	1397	173465
upa_idf_first	5148	454	3300	1394	568491
upa_idf_rnd	5148	454	3300	1394	602798
upa_idf_idf	5148	454	3300	1394	576181
uncupa_len_first	5045	455	3197	1393	391582
uncupa_len_rnd	5045	455	3197	1393	393849
uncupa_len_idf	5045	455	3197	1393	386161
uncupa_idf_first	5043	455	3195	1393	694390
uncupa_idf_rnd	5043	455	3195	1393	666826
uncupa_idf_idf	5043	455	3195	1393	666822

Table 12: Results for dataset Apj with mpr = 58

4 Dataset Customer

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	45947	279	45378	290	457185
PUCC_C	45342	276	44599	467	101465
CRM	45975	277	45419	279	305002890
upa_len_first	45947	279	45378	290	473337
upa_len_rnd	45947	279	45378	290	458153
upa_len_idf	45947	279	45378	290	461687
upa_idf_first	45966	277	45405	284	1377512
upa_idf_rnd	45966	277	45405	284	1361473
upa_idf_idf	45966	277	45405	284	1408507
uncupa_len_first	45978	276	45425	277	758264
uncupa_len_rnd	45978	276	45425	277	746647
uncupa_len_idf	45978	276	45425	277	594137
uncupa_idf_first	45978	276	45425	277	948004
uncupa_idf_rnd	45978	276	45425	277	892500
uncupa_idf_idf	45978	276	45425	277	892367

Table 13: Results for dataset Customer with mpr = 6

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	45947	279	45378	290	455628
PUCC_C	45333	276	44525	532	110034
CRM	45975	277	45419	279	346869836
upa_len_first	45947	279	45378	290	470073
upa_len_rnd	45947	279	45378	290	488844
upa_len_idf	45947	279	45378	290	468926
upa_idf_first	45966	277	45405	284	1356647
upa_idf_rnd	45966	277	45405	284	1338042
upa_idf_idf	45966	277	45405	284	1343284
uncupa_len_first	45978	276	45425	277	586571
uncupa_len_rnd	45978	276	45425	277	590049
uncupa_len_idf	45978	276	45425	277	580660
uncupa_idf_first	45978	276	45425	277	887723
uncupa_idf_rnd	45978	276	45425	277	883285
uncupa_idf_idf	45978	276	45425	277	894204

Table 14: Results for dataset Customer with mpr = 12

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	45947	279	45378	290	471118
PUCC_C	45332	276	44505	551	108237
CRM	45975	277	45419	279	349426841
upa_len_first	45947	279	45378	290	456040
upa_len_rnd	45947	279	45378	290	463105
upa_len_idf	45947	279	45378	290	461531
upa_idf_first	45966	277	45405	284	1336444
upa_idf_rnd	45966	277	45405	284	1339646
upa_idf_idf	45966	277	45405	284	1335655
uncupa_len_first	45978	276	45425	277	576649
uncupa_len_rnd	45978	276	45425	277	567360
uncupa_len_idf	45978	276	45425	277	590930
uncupa_idf_first	45978	276	45425	277	869867
uncupa_idf_rnd	45978	276	45425	277	878111
uncupa_idf_idf	45978	276	45425	277	870533

Table 15: Results for dataset Customer with mpr = 18

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	45947	279	45378	290	458174
PUCC_C	45332	276	44499	557	106307
CRM	45975	277	45419	279	348791384
upa_len_first	45947	279	45378	290	465087
upa_len_rnd	45947	279	45378	290	461364
upa_len_idf	45947	279	45378	290	463321
upa_idf_first	45966	277	45405	284	1331402
upa_idf_rnd	45966	277	45405	284	1341590
upa_idf_idf	45966	277	45405	284	1353579
uncupa_len_first	45978	276	45425	277	574049
uncupa_len_rnd	45978	276	45425	277	572358
uncupa_len_idf	45978	276	45425	277	579810
uncupa_idf_first	45978	276	45425	277	879832
uncupa_idf_rnd	45978	276	45425	277	927866
uncupa_idf_idf	45978	276	45425	277	872963

Table 16: Results for dataset Customer with mpr = 25

5 Dataset Domino

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	615	24	165	426	1520
PUCC_C	814	30	120	664	3637
CRM	775	27	184	564	2103
upa_len_first	615	24	165	426	1520
upa_len_rnd	641	25	166	450	1859
upa_len_idf	602	24	165	413	1583
upa_idf_first	629	24	184	421	3257
upa_idf_rnd	622	24	184	414	3415
upa_idf_idf	616	24	184	408	3241
uncupa_len_first	681	25	184	472	4635
uncupa_len_rnd	675	25	184	466	4909
uncupa_len_idf	563	23	184	356	4143
uncupa_idf_first	681	25	184	472	6211
uncupa_idf_rnd	628	25	186	417	6496
uncupa_idf_idf	563	23	184	356	5667

Table 17: Results for dataset Domino with mpr = 52

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	751	22	160	569	1649
PUCC_C	780	24	114	642	2906
CRM	765	22	179	564	2205
upa_len_first	751	22	160	569	1629
upa_len_rnd	751	22	160	569	1814
upa_len_idf	751	22	160	569	1676
upa_idf_first	765	22	179	564	3218
upa_idf_rnd	765	22	179	564	3417
upa_idf_idf	765	22	179	564	3279
uncupa_len_first	765	22	179	564	4404
uncupa_len_rnd	758	22	180	556	4683
uncupa_len_idf	660	21	179	460	4144
uncupa_idf_first	765	22	179	564	5971
uncupa_idf_rnd	758	22	180	556	6138
uncupa_idf_idf	660	21	179	460	5638

Table 18: Results for dataset Domino with mpr = 104

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	749	21	159	569	1602
PUCC_C	762	21	111	630	2522
CRM	763	21	178	564	2283
upa_len_first	749	21	159	569	1629
upa_len_rnd	749	21	159	569	1729
upa_len_idf	749	21	159	569	1632
upa_idf_first	763	21	178	564	3140
upa_idf_rnd	763	21	178	564	3281
upa_idf_idf	763	21	178	564	3197
uncupa_len_first	763	21	178	564	4224
uncupa_len_rnd	763	21	178	564	4353
uncupa_len_idf	763	21	178	564	4267
uncupa_idf_first	763	21	178	564	5679
uncupa_idf_rnd	763	21	178	564	5820
uncupa_idf_idf	763	21	178	564	5690

Table 19: Results for dataset Domino with mpr = 156

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	747	20	158	569	1555
PUCC_C	754	20	110	624	2211
CRM	761	20	177	564	2385
upa_len_first	747	20	158	569	1562
upa_len_rnd	747	20	158	569	1549
upa_len_idf	747	20	158	569	1572
upa_idf_first	761	20	177	564	3150
upa_idf_rnd	761	20	177	564	3131
upa_idf_idf	761	20	177	564	3346
uncupa_len_first	761	20	177	564	4173
uncupa_len_rnd	761	20	177	564	4190
uncupa_len_idf	761	20	177	564	4207
uncupa_idf_first	761	20	177	564	5626
uncupa_idf_rnd	761	20	177	564	5620
uncupa_idf_idf	761	20	177	564	5635

Table 20: Results for dataset Domino with mpr = 209

6 Dataset Emea

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	6622	65	74	6483	13040
PUCC_C	8811	80	81	8650	91458
CRM	5151	99	250	4802	18226
upa_len_first	6622	65	74	6483	13294
upa_len_rnd	7256	70	82	7104	18757
upa_len_idf	6615	65	76	6474	15237
upa_idf_first	6622	65	74	6483	46993
upa_idf_rnd	7273	70	75	7128	55928
upa_idf_idf	6613	65	74	6474	49951
uncupa_len_first	6596	65	74	6457	90897
uncupa_len_rnd	7142	70	74	6998	100158
uncupa_len_idf	6520	65	72	6383	91374
uncupa_idf_first	6565	64	74	6427	126510
uncupa_idf_rnd	7076	69	72	6935	139390
uncupa_idf_idf	6381	64	72	6245	127223

Table 21: Results for dataset Emea with mpr = 138

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	6750	45	48	6657	12025
PUCC_C	7442	49	50	7343	54546
CRM	5938	50	88	5800	13547
upa_len_first	6750	45	48	6657	12002
upa_len_rnd	7237	47	49	7141	15865
upa_len_idf	6750	45	48	6657	13078
upa_idf_first	6750	45	48	6657	38109
upa_idf_rnd	7192	47	50	7095	43114
upa_idf_idf	6750	45	48	6657	39118
uncupa_len_first	6750	45	48	6657	69300
uncupa_len_rnd	7175	47	53	7075	75638
uncupa_len_idf	6750	45	48	6657	70411
uncupa_idf_first	6750	45	48	6657	98295
uncupa_idf_rnd	7306	47	48	7211	106717
uncupa_idf_idf	6750	45	48	6657	99681

Table 22: Results for dataset Emea with mpr = 277

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	7290	39	40	7211	12404
PUCC_C	7341	39	40	7262	45709
CRM	6891	38	43	6810	15326
upa_len_first	7290	39	40	7211	12484
upa_len_rnd	7290	39	40	7211	14842
upa_len_idf	7290	39	40	7211	13272
upa_idf_first	7290	39	40	7211	38561
upa_idf_rnd	7290	39	40	7211	38367
upa_idf_idf	7290	39	40	7211	36582
uncupa_len_first	7290	39	40	7211	63725
uncupa_len_rnd	7290	39	40	7211	64084
uncupa_len_idf	7290	39	40	7211	62774
uncupa_idf_first	7290	39	40	7211	89446
uncupa_idf_rnd	7290	39	40	7211	90692
uncupa_idf_idf	7290	39	40	7211	89379

Table 23: Results for dataset Emea with mpr = 415

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	7280	34	35	7211	12220
PUCC_C	7280	34	35	7211	41034
CRM	7280	34	35	7211	17687
upa_len_first	7280	34	35	7211	12141
upa_len_rnd	7280	34	35	7211	12798
upa_len_idf	7280	34	35	7211	12254
upa_idf_first	7280	34	35	7211	34419
upa_idf_rnd	7280	34	35	7211	34576
upa_idf_idf	7280	34	35	7211	34480
uncupa_len_first	7280	34	35	7211	59342
uncupa_len_rnd	7280	34	35	7211	59257
uncupa_len_idf	7280	34	35	7211	59733
uncupa_idf_first	7280	34	35	7211	84258
uncupa_idf_rnd	7280	34	35	7211	84267
uncupa_idf_idf	7280	34	35	7211	84331

Table 24: Results for dataset Emea with mpr = 554

7 Dataset Firewall 1

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	3298	67	2329	902	15921
PUCC_C	27852	224	881	26747	142386
CRM	3206	69	2297	840	49220
upa_len_first	3298	67	2329	902	16278
upa_len_rnd	3298	67	2329	902	16479
upa_len_idf	3298	67	2329	902	16899
upa_idf_first	3279	67	2313	899	223291
upa_idf_rnd	3279	67	2313	899	226585
upa_idf_idf	3279	67	2313	899	225901
uncupa_len_first	3252	71	2277	904	43288
uncupa_len_rnd	3252	71	2277	904	46867
uncupa_len_idf	3252	71	2277	904	44175
uncupa_idf_first	3240	71	2277	892	167212
uncupa_idf_rnd	3240	71	2277	892	164515
uncupa_idf_idf	3240	71	2277	892	165637

Table 25: Results for dataset Firewall 1 with mpr = 154

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	3296	66	2328	902	16405
PUCC_C	5749	71	751	4927	28763
CRM	3204	68	2296	840	51456
upa_len_first	3296	66	2328	902	16098
upa_len_rnd	3296	66	2328	902	16746
upa_len_idf	3296	66	2328	902	16412
upa_idf_first	3277	66	2312	899	224797
upa_idf_rnd	3277	66	2312	899	224417
upa_idf_idf	3277	66	2312	899	223342
uncupa_len_first	3250	70	2276	904	42326
uncupa_len_rnd	3250	70	2276	904	43114
uncupa_len_idf	3250	70	2276	904	42960
uncupa_idf_first	3238	70	2276	892	165341
uncupa_idf_rnd	3238	70	2276	892	166536
uncupa_idf_idf	3238	70	2276	892	166197

Table 26: Results for dataset Firewall 1 with mpr = 308

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	3294	65	2327	902	16142
PUCC_C	5061	68	748	4245	25537
CRM	3202	67	2295	840	53654
upa_len_first	3294	65	2327	902	16317
upa_len_rnd	3294	65	2327	902	16529
upa_len_idf	3294	65	2327	902	16106
upa_idf_first	3275	65	2311	899	222282
upa_idf_rnd	3275	65	2311	899	226370
upa_idf_idf	3275	65	2311	899	223891
uncupa_len_first	3248	69	2275	904	42472
uncupa_len_rnd	3248	69	2275	904	42363
uncupa_len_idf	3248	69	2275	904	42633
uncupa_idf_first	3236	69	2275	892	167181
uncupa_idf_rnd	3236	69	2275	892	167381
uncupa_idf_idf	3236	69	2275	892	165267

Table 27: Results for dataset Firewall 1 with mpr = 462

Heuristic	WSC	$\|\mathcal{R}\|$	$\|\mathcal{UA}\|$	$\|\mathcal{PA}\|$	Time
PUCC_R	3294	65	2327	902	15803
PUCC_C	4822	67	747	4008	25124
CRM	3202	67	2295	840	54466
upa_len_first	3294	65	2327	902	16154
upa_len_rnd	3294	65	2327	902	15963
upa_len_idf	3294	65	2327	902	16405
upa_idf_first	3275	65	2311	899	225075
upa_idf_rnd	3275	65	2311	899	221358
upa_idf_idf	3275	65	2311	899	222773
uncupa_len_first	3248	69	2275	904	41944
uncupa_len_rnd	3248	69	2275	904	42600
uncupa_len_idf	3248	69	2275	904	42142
uncupa_idf_first	3236	69	2275	892	166129
uncupa_idf_rnd	3236	69	2275	892	165710
uncupa_idf_idf	3236	69	2275	892	168320

Table 28: Results for dataset Firewall 1 with mpr = 617

8 Dataset Firewall 2

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	1649	12	1018	619	8642
PUCC_C	1695	15	579	1101	9038
CRM	1942	14	1068	860	2454
upa_len_first	1649	12	1018	619	8858
upa_len_rnd	1649	12	1018	619	9095
upa_len_idf	1649	12	1018	619	8642
upa_idf_first	1671	12	1068	591	55794
upa_idf_rnd	1671	12	1068	591	55100
upa_idf_idf	1671	12	1068	591	56491
uncupa_len_first	1794	13	1068	713	12061
uncupa_len_rnd	1794	13	1068	713	14894
uncupa_len_idf	1794	13	1068	713	12171
uncupa_idf_first	1794	13	1068	713	52303
uncupa_idf_rnd	1818	13	1068	737	54703
uncupa_idf_idf	1794	13	1068	713	53437

Table 29: Results for dataset Firewall 2 with mpr = 147

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	1542	10	913	619	7353
PUCC_C	1605	12	468	1125	6665
CRM	1564	10	963	591	1963
upa_len_first	1542	10	913	619	7336
upa_len_rnd	1542	10	913	619	7379
upa_len_idf	1542	10	913	619	7326
upa_idf_first	1564	10	963	591	47230
upa_idf_rnd	1564	10	963	591	47084
upa_idf_idf	1564	10	963	591	48134
uncupa_len_first	1834	11	963	860	11149
uncupa_len_rnd	1834	11	963	860	12018
uncupa_len_idf	1834	11	963	860	11257
uncupa_idf_first	1834	11	963	860	49513
uncupa_idf_rnd	1834	11	963	860	50608
uncupa_idf_idf	1834	11	963	860	49411

Table 30: Results for dataset Firewall 2 with mpr = 295

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	1542	10	913	619	7482
PUCC_C	1524	11	384	1129	6617
CRM	1564	10	963	591	2027
upa_len_first	1542	10	913	619	7523
upa_len_rnd	1542	10	913	619	7566
upa_len_idf	1542	10	913	619	7425
upa_idf_first	1564	10	963	591	46149
upa_idf_rnd	1564	10	963	591	46770
upa_idf_idf	1564	10	963	591	47061
uncupa_len_first	1834	11	963	860	10904
uncupa_len_rnd	1834	11	963	860	11700
uncupa_len_idf	1834	11	963	860	10963
uncupa_idf_first	1834	11	963	860	48170
uncupa_idf_rnd	1834	11	963	860	49133
uncupa_idf_idf	1834	11	963	860	48595

Table 31: Results for dataset Firewall 2 with mpr = 442

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	1542	10	913	619	7371
PUCC_C	1466	10	337	1119	5650
CRM	1564	10	963	591	1985
upa_len_first	1542	10	913	619	7370
upa_len_rnd	1542	10	913	619	7404
upa_len_idf	1542	10	913	619	7577
upa_idf_first	1564	10	963	591	47268
upa_idf_rnd	1564	10	963	591	46986
upa_idf_idf	1564	10	963	591	47046
uncupa_len_first	1787	10	917	860	10750
uncupa_len_rnd	1787	10	917	860	10760
uncupa_len_idf	1787	10	917	860	10796
uncupa_idf_first	1787	10	917	860	48097
uncupa_idf_rnd	1787	10	917	860	46999
uncupa_idf_idf	1787	10	917	860	47308

Table 32: Results for dataset Firewall 2 with mpr = 590

9 Dataset Healthcare

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	431	15	358	58	1029
PUCC_C	438	28	175	235	1649
CRM	451	33	164	254	1875
upa_len_first	431	15	358	58	1016
upa_len_rnd	431	15	358	58	1050
upa_len_idf	431	15	358	58	1038
upa_idf_first	430	15	362	53	3451
upa_idf_rnd	430	15	362	53	3091
upa_idf_idf	430	15	362	53	3032
uncupa_len_first	352	15	273	64	1174
uncupa_len_rnd	352	15	273	64	1209
uncupa_len_idf	352	15	273	64	1179
uncupa_idf_first	397	15	325	57	2045
uncupa_idf_rnd	397	15	325	57	2081
uncupa_idf_idf	397	15	325	57	2069

Table 33: Results for dataset Healthcare with mpr = 11

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	385	14	313	58	914
PUCC_C	425	21	106	298	1582
CRM	384	14	317	53	982
upa_len_first	385	14	313	58	909
upa_len_rnd	385	14	313	58	910
upa_len_idf	385	14	313	58	902
upa_idf_first	384	14	317	53	2715
upa_idf_rnd	384	14	317	53	3242
upa_idf_idf	384	14	317	53	2724
uncupa_len_first	306	14	228	64	1035
uncupa_len_rnd	306	14	228	64	1037
uncupa_len_idf	306	14	228	64	1552
uncupa_idf_first	351	14	280	57	1766
uncupa_idf_rnd	351	14	280	57	1763
uncupa_idf_idf	351	14	280	57	1765

Table 34: Results for dataset Healthcare with mpr = 22

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	385	14	313	58	1430
PUCC_C	351	15	81	255	1123
CRM	384	14	317	53	1098
upa_len_first	385	14	313	58	910
upa_len_rnd	385	14	313	58	912
upa_len_idf	385	14	313	58	911
upa_idf_first	384	14	317	53	2728
upa_idf_rnd	384	14	317	53	2732
upa_idf_idf	384	14	317	53	2733
uncupa_len_first	306	14	228	64	1050
uncupa_len_rnd	306	14	228	64	1043
uncupa_len_idf	306	14	228	64	1048
uncupa_idf_first	351	14	280	57	1775
uncupa_idf_rnd	351	14	280	57	1783
uncupa_idf_idf	351	14	280	57	1769

Table 35: Results for dataset Healthcare with mpr = 33

Heuristic	WSC	$\lvert\mathcal{R}\rvert$	$\lvert\mathcal{UA}\rvert$	$\lvert\mathcal{PA}\rvert$	Time
PUCC_R	385	14	313	58	1012
PUCC_C	344	14	79	251	1268
CRM	384	14	317	53	1317
upa_len_first	385	14	313	58	1024
upa_len_rnd	385	14	313	58	938
upa_len_idf	385	14	313	58	905
upa_idf_first	384	14	317	53	2722
upa_idf_rnd	384	14	317	53	2717
upa_idf_idf	384	14	317	53	2718
uncupa_len_first	306	14	228	64	1030
uncupa_len_rnd	306	14	228	64	1041
uncupa_len_idf	306	14	228	64	1034
uncupa_idf_first	351	14	280	57	1764
uncupa_idf_rnd	351	14	280	57	1757
uncupa_idf_idf	351	14	280	57	1763

Table 36: Results for dataset Healthcare with mpr = 45