

A APPENDIX

A.1 DATASETS STATISTICS AND SYNTAX OF SROIQ CONCEPTS

Table 1: Detailed information about the datasets used for evaluation.

Dataset	Ind.	Classes	Prop.	TBox	ABox
Carcinogenesis	22,372	142	4	144	74,223
Mutagenesis	14,145	86	5	82	47,722
Semantic Bible	724	48	29	56	3,106
Vicodi	33,238	194	10	204	116,181
Family	202	18	4	26	472
Father	6	4	1	3	4

A.2 SECOND SET OF EXPERIMENTS: RETRIEVAL RESULTS IN A CLOSED WORD SCENARIO WITH INCOMPLETE DATASETS

Table 2: Retrieval performance on the *Father* dataset with different levels of incompleteness. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type.

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		OpenIlet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	3	1.000	0.003	1.000	0.003	1.000	0.003	1.000	0.003	1.000	0.001
	OWLObjectAllValuesFrom	12	0.167	0.008	0.167	0.002	0.167	0.003	0.167	0.007	1.000	0.002
	OWLObjectComplementOf	3	1.000	0.019	1.000	0.002	1.000	0.003	1.000	0.002	1.000	0.001
	OWLObjectIntersectionOf	36	1.000	0.032	0.889	0.006	1.000	0.005	0.889	0.003	1.000	0.001
	OWLObjectMaxCardinality	36	0.167	0.007	0.167	0.003	0.167	0.006	0.167	0.003	1.000	0.001
	OWLObjectMinCardinality	36	1.000	0.007	1.000	0.002	1.000	0.003	1.000	0.002	1.000	0.001
	OWLObjectSomeValuesFrom	12	1.000	0.008	1.000	0.003	1.000	0.003	1.000	0.002	1.000	0.001
10	OWLObjectUnionOf	36	1.000	0.004	1.000	0.004	1.000	0.004	1.000	0.006	1.000	0.001
	OWLClass	3	1.000	0.002	1.000	0.002	1.000	0.002	1.000	0.002	1.000	0.001
	OWLObjectAllValuesFrom	12	0.167	0.008	0.167	0.003	0.167	0.003	0.167	0.002	1.000	0.002
	OWLObjectComplementOf	3	1.000	0.003	1.000	0.002	1.000	0.002	1.000	0.002	1.000	0.001
	OWLObjectIntersectionOf	36	1.000	0.008	0.889	0.009	1.000	0.003	0.889	0.002	1.000	0.001
	OWLObjectMaxCardinality	36	0.167	0.004	0.167	0.004	0.167	0.003	0.167	0.002	1.000	0.001
	OWLObjectMinCardinality	36	1.000	0.009	1.000	0.005	1.000	0.006	1.000	0.005	1.000	0.001
20	OWLObjectSomeValuesFrom	12	1.000	0.003	1.000	0.002	1.000	0.003	1.000	0.002	1.000	0.001
	OWLObjectUnionOf	36	1.000	0.037	1.000	0.005	1.000	0.005	1.000	0.003	1.000	0.001
	OWLClass	3	0.861	0.002	0.861	0.001	0.861	0.002	0.861	0.001	0.861	0.001
	OWLObjectAllValuesFrom	12	0.139	0.003	0.139	0.002	0.139	0.002	0.139	0.002	0.776	0.002
	OWLObjectComplementOf	3	0.917	0.003	0.917	0.002	0.917	0.002	0.917	0.002	0.917	0.001
	OWLObjectIntersectionOf	36	0.940	0.010	0.845	0.002	0.940	0.005	0.845	0.005	0.940	0.001
	OWLObjectMaxCardinality	36	0.139	0.015	0.139	0.010	0.139	0.003	0.139	0.002	0.838	0.001
40	OWLObjectMinCardinality	36	0.838	0.009	0.838	0.005	0.838	0.003	0.838	0.002	0.838	0.001
	OWLObjectSomeValuesFrom	12	0.597	0.003	0.597	0.002	0.597	0.003	0.597	0.002	0.597	0.001
	OWLObjectUnionOf	36	0.856	0.030	0.856	0.005	0.856	0.006	0.856	0.003	0.856	0.001
	OWLClass	3	0.639	0.017	0.639	0.002	0.639	0.002	0.639	0.002	0.639	0.001
	OWLObjectAllValuesFrom	12	0.111	0.009	0.111	0.006	0.111	0.003	0.111	0.003	0.544	0.001
	OWLObjectComplementOf	3	0.750	0.003	0.750	0.002	0.750	0.002	0.750	0.002	0.750	0.001
	OWLObjectIntersectionOf	36	0.824	0.030	0.774	0.008	0.824	0.004	0.774	0.002	0.824	0.001
80	OWLObjectMaxCardinality	36	0.111	0.007	0.111	0.003	0.111	0.003	0.111	0.003	0.670	0.001
	OWLObjectMinCardinality	36	0.838	0.009	0.838	0.004	0.838	0.005	0.838	0.002	0.838	0.001
	OWLObjectSomeValuesFrom	12	0.597	0.004	0.597	0.002	0.597	0.003	0.597	0.013	0.597	0.001
	OWLObjectUnionOf	36	0.657	0.004	0.657	0.002	0.657	0.003	0.657	0.005	0.657	0.001
	OWLClass	3	0.278	0.002	0.278	0.002	0.278	0.002	0.278	0.002	0.639	0.001
	OWLObjectAllValuesFrom	12	0.056	0.008	0.056	0.002	0.056	0.003	0.056	0.002	0.544	0.001
	OWLObjectComplementOf	3	0.500	0.002	0.500	0.002	0.500	0.002	0.500	0.002	0.750	0.001
	OWLObjectIntersectionOf	36	0.648	0.030	0.648	0.006	0.648	0.004	0.648	0.002	0.824	0.001
	OWLObjectMaxCardinality	36	0.056	0.005	0.056	0.002	0.056	0.003	0.056	0.002	0.670	0.001
	OWLObjectMinCardinality	36	0.694	0.008	0.694	0.002	0.694	0.003	0.694	0.002	0.838	0.001
	OWLObjectSomeValuesFrom	12	0.167	0.007	0.167	0.002	0.167	0.003	0.167	0.002	0.597	0.001
	OWLObjectUnionOf	36	0.315	0.006	0.315	0.003	0.315	0.003	0.315	0.005	0.657	0.001

Table 3: Retrieval performance on the *Family* dataset with different levels of incompleteness. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		Openllet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	18	1.000	0.013	1.000	0.018	1.000	0.023	1.000	0.011	1.000	0.008
	OWLObjectAllValuesFrom	288	0.000	0.408	0.000	0.013	0.000	0.021	0.000	0.013	1.000	0.151
	OWLObjectComplementOf	18	0.056	0.403	0.056	0.014	0.056	0.018	0.056	0.010	1.000	0.006
	OWLObjectIntersectionOf	1296	0.387	0.231	0.387	0.014	0.387	0.021	0.387	0.013	1.000	0.013
	OWLObjectMaxCardinality	864	0.000	0.409	0.000	0.013	0.000	0.022	0.000	0.012	1.000	0.079
	OWLObjectMinCardinality	864	0.565	0.438	0.565	0.025	0.565	0.024	0.565	0.025	1.000	0.079
	OWLObjectSomeValuesFrom	288	0.556	0.418	0.556	0.012	0.556	0.025	0.556	0.013	1.000	0.078
	OWLObjectUnionOf	1296	0.521	0.318	0.521	0.014	0.521	0.023	0.521	0.014	1.000	0.013
10	OWLClass	18	0.931	0.012	0.931	0.019	0.931	0.014	0.931	0.014	0.931	0.006
	OWLObjectAllValuesFrom	288	0.000	0.344	0.000	0.012	0.000	0.019	0.000	0.012	0.849	0.132
	OWLObjectComplementOf	18	0.056	0.336	0.056	0.010	0.056	0.021	0.056	0.018	0.895	0.007
	OWLObjectIntersectionOf	1296	0.378	0.196	0.378	0.012	0.378	0.021	0.378	0.012	0.933	0.013
	OWLObjectMaxCardinality	864	0.000	0.346	0.000	0.013	0.000	0.019	0.000	0.012	0.896	0.069
	OWLObjectMinCardinality	864	0.546	0.368	0.546	0.021	0.546	0.020	0.546	0.021	0.943	0.070
	OWLObjectSomeValuesFrom	288	0.500	0.353	0.500	0.013	0.500	0.021	0.500	0.013	0.889	0.070
	OWLObjectUnionOf	1296	0.480	0.269	0.480	0.013	0.480	0.020	0.480	0.013	0.904	0.013
20	OWLClass	18	0.826	0.010	0.826	0.012	0.826	0.012	0.826	0.008	0.826	0.006
	OWLObjectAllValuesFrom	288	0.000	0.262	0.000	0.010	0.000	0.014	0.000	0.011	0.729	0.110
	OWLObjectComplementOf	18	0.056	0.258	0.056	0.008	0.056	0.019	0.056	0.008	0.805	0.006
	OWLObjectIntersectionOf	1296	0.360	0.149	0.360	0.010	0.360	0.015	0.360	0.010	0.854	0.012
	OWLObjectMaxCardinality	864	0.000	0.267	0.000	0.011	0.000	0.015	0.000	0.009	0.794	0.058
	OWLObjectMinCardinality	864	0.518	0.281	0.518	0.017	0.518	0.016	0.518	0.016	0.806	0.058
	OWLObjectSomeValuesFrom	288	0.417	0.270	0.417	0.011	0.417	0.016	0.417	0.010	0.733	0.059
	OWLObjectUnionOf	1296	0.426	0.204	0.426	0.011	0.426	0.016	0.426	0.010	0.805	0.012
40	OWLClass	18	0.613	0.012	0.613	0.006	0.613	0.014	0.613	0.006	0.613	0.005
	OWLObjectAllValuesFrom	288	0.000	0.135	0.000	0.007	0.000	0.011	0.000	0.007	0.528	0.072
	OWLObjectComplementOf	18	0.056	0.141	0.056	0.006	0.056	0.008	0.056	0.006	0.623	0.005
	OWLObjectIntersectionOf	1296	0.316	0.080	0.316	0.008	0.316	0.012	0.316	0.007	0.687	0.010
	OWLObjectMaxCardinality	864	0.000	0.136	0.000	0.009	0.000	0.011	0.000	0.008	0.595	0.039
	OWLObjectMinCardinality	864	0.466	0.144	0.466	0.011	0.466	0.013	0.466	0.010	0.614	0.039
	OWLObjectSomeValuesFrom	288	0.260	0.137	0.260	0.008	0.260	0.011	0.260	0.007	0.442	0.039
	OWLObjectUnionOf	1296	0.318	0.108	0.318	0.009	0.318	0.012	0.318	0.008	0.606	0.010
80	OWLClass	18	0.210	0.003	0.210	0.003	0.210	0.004	0.210	0.003	0.210	0.003
	OWLObjectAllValuesFrom	288	0.000	0.027	0.000	0.004	0.000	0.006	0.000	0.003	0.173	0.020
	OWLObjectComplementOf	18	0.056	0.022	0.056	0.003	0.056	0.004	0.056	0.003	0.241	0.004
	OWLObjectIntersectionOf	1296	0.239	0.017	0.239	0.003	0.239	0.006	0.239	0.003	0.361	0.007
	OWLObjectMaxCardinality	864	0.000	0.030	0.000	0.005	0.000	0.005	0.000	0.003	0.202	0.012
	OWLObjectMinCardinality	864	0.406	0.027	0.406	0.004	0.406	0.005	0.406	0.003	0.413	0.012
	OWLObjectSomeValuesFrom	288	0.079	0.025	0.079	0.003	0.079	0.006	0.079	0.003	0.099	0.012
	OWLObjectUnionOf	1296	0.109	0.020	0.109	0.004	0.109	0.005	0.109	0.003	0.204	0.007

A.3 THIRD SET OF EXPERIMENTS: RETRIEVAL RESULTS IN A CLOSED WORD SCENARIO WITH NOISY DATASETS

Table 4: Retrieval performance on the *Carcinogenesis* dataset with different levels of incompleteness. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type.

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		Openllet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	2	1.000	1.249	1.000	1.132	1.000	49.928	1.000	1.105	1.000	0.815
	OWLObjectComplementOf	2	0.589	1052.861	0.589	1.506	0.589	50.418	0.589	1.417	1.000	0.763
	OWLObjectIntersectionOf	16	0.647	866.197	0.647	1.343	0.647	49.561	0.647	1.254	1.000	1.634
	OWLObjectUnionOf	16	0.795	628.243	0.795	1.433	0.795	49.369	0.795	1.365	1.000	3.123
40	OWLClass	5	0.359	0.234	0.359	0.220	0.359	4.966	0.359	0.235	0.352	0.292
	OWLObjectComplementOf	5	0.164	64.514	0.164	0.287	0.164	5.430	0.164	0.284	0.276	7.472
	OWLObjectIntersectionOf	20	0.631	94.602	0.631	0.223	0.631	5.455	0.631	0.233	0.657	3.034
	OWLObjectUnionOf	20	0.269	16.343	0.269	0.311	0.269	5.321	0.269	0.306	0.295	0.633
60	OWLClass	5	0.151	0.556	0.151	0.270	0.151	1.868	0.151	0.117	0.143	0.302
	OWLObjectComplementOf	5	0.079	19.983	0.079	0.115	0.079	1.829	0.079	0.152	0.132	4.718
	OWLObjectIntersectionOf	20	0.558	29.184	0.558	0.125	0.558	1.823	0.558	0.101	0.569	3.867
	OWLObjectUnionOf	20	0.124	4.906	0.124	0.128	0.124	1.921	0.124	0.135	0.135	0.560
80	OWLClass	4	0.119	0.086	0.119	0.076	0.119	0.966	0.119	0.094	0.119	0.205
	OWLObjectComplementOf	4	0.099	3.389	0.099	0.143	0.099	1.117	0.099	0.117	0.120	4.255
	OWLObjectIntersectionOf	32	0.419	6.469	0.419	0.107	0.419	1.120	0.419	0.091	0.387	0.260
	OWLObjectUnionOf	32	0.111	2.227	0.111	0.117	0.111	1.081	0.111	0.135	0.121	0.791
90	OWLClass	4	0.150	0.098	0.150	0.034	0.150	0.273	0.150	0.046	0.108	0.266
	OWLObjectComplementOf	4	0.039	1.335	0.039	0.047	0.039	0.329	0.039	0.047	0.055	0.282
	OWLObjectIntersectionOf	32	0.439	2.602	0.439	0.045	0.439	0.342	0.439	0.049	0.377	0.479
	OWLObjectUnionOf	32	0.061	1.232	0.061	0.066	0.061	0.370	0.061	0.059	0.062	1.464

Table 5: Retrieval performance on the *Mutagenesis* dataset with different levels of incompleteness. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type.

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		Openllet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	5	1.000	0.718	1.000	0.658	1.000	17.521	1.000	0.639	1.000	1.860
	OWLObjectComplementOf	5	0.000	781.758	0.000	0.694	0.000	19.605	0.000	0.669	0.909	10.422
	OWLObjectIntersectionOf	20	0.750	585.475	0.750	0.690	0.750	18.018	0.750	0.658	0.977	6.568
	OWLObjectUnionOf	20	0.750	197.910	0.750	0.813	0.750	18.649	0.750	0.779	0.932	3.721
10	OWLClass	5	0.915	0.465	0.915	0.455	0.915	10.002	0.915	0.456	0.914	0.368
	OWLObjectComplementOf	5	0.000	373.715	0.000	0.465	0.000	9.762	0.000	0.443	0.711	0.358
	OWLObjectIntersectionOf	20	0.729	281.808	0.729	0.478	0.729	9.937	0.729	0.448	0.906	5.408
	OWLObjectUnionOf	20	0.597	94.854	0.597	0.567	0.597	9.756	0.597	0.563	0.762	0.814
20	OWLClass	5	0.675	0.293	0.675	0.295	0.675	5.721	0.675	0.299	0.674	0.851
	OWLObjectComplementOf	5	0.000	170.452	0.000	0.275	0.000	5.795	0.000	0.279	0.507	4.132
	OWLObjectIntersectionOf	20	0.669	127.305	0.669	0.320	0.669	5.769	0.669	0.301	0.795	4.937
	OWLObjectUnionOf	20	0.438	43.052	0.438	0.367	0.438	5.709	0.438	0.329	0.549	1.664
40	OWLClass	5	0.667	0.153	0.667	0.162	0.667	2.068	0.667	0.122	0.667	0.353
	OWLObjectComplementOf	5	0.000	52.448	0.000	0.136	0.000	2.092	0.000	0.118	0.245	0.336
	OWLObjectIntersectionOf	20	0.667	39.716	0.667	0.136	0.667	2.028	0.667	0.127	0.728	4.470
	OWLObjectUnionOf	20	0.305	13.320	0.305	0.202	0.305	2.110	0.305	0.173	0.351	0.734
80	OWLClass	5	0.200	0.426	0.200	0.050	0.200	0.223	0.200	0.038	0.200	0.124
	OWLObjectComplementOf	5	0.000	3.332	0.000	0.127	0.000	0.243	0.000	0.046	0.050	0.643
	OWLObjectIntersectionOf	20	0.550	2.267	0.550	0.039	0.550	0.223	0.550	0.039	0.563	1.663
	OWLObjectUnionOf	20	0.075	0.791	0.075	0.042	0.075	0.195	0.075	0.029	0.088	0.296

Table 6: Retrieval performance on the *Semantic Bible* dataset with different levels of incompleteness. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type.

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		OpenIlet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	5	1.000	0.105	1.000	0.079	1.000	0.232	1.000	0.066	1.000	0.920
	OWLObjectComplementOf	5	0.027	19.699	0.027	0.061	0.027	0.201	0.027	0.065	0.903	2.533
	OWLObjectIntersectionOf	20	0.757	14.462	0.757	0.066	0.757	0.191	0.757	0.055	0.976	3.641
	OWLObjectUnionOf	20	0.757	5.095	0.757	0.089	0.757	0.211	0.757	0.082	0.928	1.774
10	OWLClass	5	0.768	0.074	0.768	0.054	0.768	0.135	0.768	0.056	0.768	5.040
	OWLObjectComplementOf	5	0.002	9.937	0.002	0.047	0.002	0.134	0.002	0.031	0.741	4.827
	OWLObjectIntersectionOf	20	0.693	7.288	0.693	0.049	0.693	0.136	0.693	0.070	0.877	12.408
	OWLObjectUnionOf	20	0.562	2.740	0.562	0.074	0.562	0.149	0.562	0.073	0.747	9.971
20	OWLClass	5	0.515	0.068	0.515	0.044	0.515	0.063	0.515	0.082	0.515	0.397
	OWLObjectComplementOf	5	0.001	5.461	0.001	0.024	0.001	0.057	0.001	0.024	0.540	3.687
	OWLObjectIntersectionOf	20	0.629	3.926	0.629	0.042	0.629	0.095	0.629	0.041	0.764	2.173
	OWLObjectUnionOf	20	0.399	1.345	0.399	0.055	0.399	0.096	0.399	0.044	0.534	0.767
40	OWLClass	5	0.337	0.072	0.337	0.018	0.337	0.049	0.337	0.018	0.337	0.528
	OWLObjectComplementOf	5	0.013	1.750	0.013	0.053	0.013	0.032	0.013	0.040	0.273	2.678
	OWLObjectIntersectionOf	20	0.587	1.465	0.587	0.040	0.587	0.085	0.587	0.048	0.653	2.468
	OWLObjectUnionOf	20	0.226	0.471	0.226	0.030	0.226	0.057	0.226	0.020	0.291	1.093
80	OWLClass	5	0.100	0.014	0.100	0.012	0.100	0.030	0.100	0.010	0.100	0.335
	OWLObjectComplementOf	5	0.000	0.200	0.000	0.011	0.000	0.022	0.000	0.012	0.051	0.329
	OWLObjectIntersectionOf	20	0.525	0.153	0.525	0.034	0.525	0.028	0.525	0.028	0.538	1.462
	OWLObjectUnionOf	20	0.050	0.203	0.050	0.059	0.050	0.034	0.050	0.016	0.063	0.696

Table 7: Retrieval performance on the *Vicodi* dataset with different levels of incompleteness. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type.

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		OpenIlet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	3	1.000	3.028	1.000	1.460	1.000	125.599	1.000	1.386	1.000	0.204
	OWLObjectComplementOf	3	0.995	47.866	0.995	2.037	0.995	128.398	0.995	1.923	1.000	0.242
	OWLObjectIntersectionOf	36	0.887	2224.491	0.887	1.577	0.887	127.387	0.887	1.564	1.000	0.899
	OWLObjectUnionOf	36	0.998	314.949	0.998	1.886	0.998	128.206	0.998	1.842	1.000	0.515
40	OWLClass	1	0.333	0.881	0.333	0.507	0.333	14.781	0.333	0.436	0.333	0.380
	OWLObjectComplementOf	1	0.269	14.052	0.269	0.596	0.269	14.619	0.269	0.564	0.277	0.406
	OWLObjectIntersectionOf	4	0.650	358.309	0.650	0.494	0.650	14.577	0.650	0.472	0.652	8.060
	OWLObjectUnionOf	4	0.289	4.500	0.289	0.583	0.289	14.734	0.289	0.541	0.291	2.733
60	OWLClass	5	0.301	0.401	0.301	0.213	0.301	5.149	0.301	0.183	0.097	0.450
	OWLObjectComplementOf	5	0.128	2.358	0.128	0.379	0.128	5.147	0.128	0.297	0.131	0.553
	OWLObjectIntersectionOf	20	0.607	98.498	0.607	0.254	0.607	5.210	0.607	0.237	0.557	5.892
	OWLObjectUnionOf	20	0.173	1.040	0.173	0.276	0.173	5.289	0.173	0.259	0.123	4.437
80	OWLClass	15	0.195	0.168	0.195	0.081	0.195	1.208	0.195	0.079	0.195	2.166
	OWLObjectComplementOf	15	0.047	4.810	0.047	0.087	0.047	1.332	0.047	0.085	0.050	3.097
	OWLObjectIntersectionOf	180	0.424	14.618	0.424	0.093	0.424	1.246	0.424	0.086	0.427	4.724
	OWLObjectUnionOf	180	0.076	4.428	0.076	0.103	0.076	1.227	0.076	0.102	0.077	5.488
90	OWLClass	5	0.000	0.121	0.000	0.060	0.000	0.353	0.000	0.060	0.000	0.472
	OWLObjectComplementOf	5	0.019	1.351	0.019	0.109	0.019	0.402	0.019	0.043	0.022	0.471
	OWLObjectIntersectionOf	20	0.505	3.360	0.505	0.077	0.505	0.322	0.505	0.081	0.506	8.151
	OWLObjectUnionOf	20	0.016	0.536	0.016	0.083	0.016	0.362	0.016	0.054	0.017	0.981

Table 8: Retrieval performance on the *Family* dataset with different levels of **noises**. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		OpenIlet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	18	1.000	0.013	1.000	0.018	1.000	0.023	1.000	0.011	1.000	0.008
	OWLObjectAllValuesFrom	288	0.000	0.408	0.000	0.013	0.000	0.021	0.000	0.013	1.000	0.151
	OWLObjectComplementOf	18	0.056	0.403	0.056	0.014	0.056	0.018	0.056	0.010	1.000	0.006
	OWLObjectIntersectionOf	1296	0.387	0.231	0.387	0.014	0.387	0.021	0.387	0.013	1.000	0.013
	OWLObjectMaxCardinality	864	0.000	0.409	0.000	0.013	0.000	0.022	0.000	0.012	1.000	0.079
	OWLObjectMinCardinality	864	0.565	0.438	0.565	0.025	0.565	0.024	0.565	0.025	1.000	0.079
	OWLObjectSomeValuesFrom	288	0.556	0.418	0.556	0.012	0.556	0.025	0.556	0.013	1.000	0.078
	OWLObjectUnionOf	1296	0.521	0.318	0.521	0.014	0.521	0.023	0.521	0.014	1.000	0.013
10	OWLClass	18	0.879	0.004	0.879	0.002	0.879	0.010	0.879	0.002	0.879	0.008
	OWLObjectAllValuesFrom	288	0.000	0.399	0.000	0.001	0.000	0.010	0.000	0.001	0.906	0.244
	OWLObjectComplementOf	18	0.056	0.395	0.056	0.003	0.056	0.014	0.056	0.004	0.918	0.010
	OWLObjectIntersectionOf	1296	0.298	0.218	0.298	0.001	0.298	0.011	0.298	0.001	0.795	0.021
	OWLObjectMaxCardinality	864	0.000	0.400	0.000	0.001	0.000	0.010	0.000	0.001	0.986	0.124
	OWLObjectMinCardinality	864	0.536	0.425	0.536	0.010	0.536	0.011	0.536	0.011	0.671	0.124
	OWLObjectSomeValuesFrom	288	0.469	0.405	0.469	0.002	0.469	0.012	0.469	0.002	0.817	0.124
	OWLObjectUnionOf	1296	0.501	0.306	0.501	0.002	0.501	0.011	0.501	0.002	0.934	0.020
20	OWLClass	18	0.780	0.005	0.780	0.002	0.780	0.007	0.780	0.002	0.780	0.006
	OWLObjectAllValuesFrom	288	0.000	0.496	0.000	0.001	0.000	0.013	0.000	0.001	0.817	0.197
	OWLObjectComplementOf	18	0.056	0.495	0.056	0.001	0.056	0.009	0.056	0.001	0.840	0.007
	OWLObjectIntersectionOf	1296	0.268	0.272	0.268	0.001	0.268	0.011	0.268	0.001	0.680	0.017
	OWLObjectMaxCardinality	864	0.000	0.499	0.000	0.001	0.000	0.010	0.000	0.001	0.973	0.109
	OWLObjectMinCardinality	864	0.514	0.536	0.514	0.012	0.514	0.012	0.514	0.013	0.538	0.111
	OWLObjectSomeValuesFrom	288	0.404	0.511	0.404	0.002	0.404	0.012	0.404	0.003	0.699	0.111
	OWLObjectUnionOf	1296	0.489	0.381	0.489	0.002	0.489	0.012	0.489	0.002	0.878	0.018
40	OWLClass	18	0.660	0.007	0.660	0.002	0.660	0.019	0.660	0.002	0.660	0.006
	OWLObjectAllValuesFrom	288	0.000	0.667	0.000	0.001	0.000	0.013	0.000	0.001	0.683	0.132
	OWLObjectComplementOf	18	0.056	0.663	0.056	0.001	0.056	0.013	0.056	0.004	0.717	0.006
	OWLObjectIntersectionOf	1296	0.240	0.364	0.240	0.002	0.240	0.013	0.240	0.002	0.545	0.012
	OWLObjectMaxCardinality	864	0.000	0.999	0.000	0.001	0.000	0.012	0.000	0.002	0.946	0.070
	OWLObjectMinCardinality	864	0.489	0.725	0.489	0.015	0.489	0.013	0.489	0.015	0.397	0.070
	OWLObjectSomeValuesFrom	288	0.328	0.682	0.328	0.002	0.328	0.013	0.328	0.002	0.567	0.071
	OWLObjectUnionOf	1296	0.478	0.510	0.478	0.002	0.478	0.013	0.478	0.002	0.802	0.012
80	OWLClass	18	0.532	0.006	0.532	0.002	0.532	0.020	0.532	0.002	0.532	0.007
	OWLObjectAllValuesFrom	288	0.000	1.172	0.000	0.001	0.000	0.015	0.000	0.001	0.500	0.165
	OWLObjectComplementOf	18	0.056	1.167	0.056	0.001	0.056	0.017	0.056	0.001	0.541	0.007
	OWLObjectIntersectionOf	1296	0.212	0.636	0.212	0.002	0.212	0.016	0.212	0.002	0.399	0.016
	OWLObjectMaxCardinality	864	0.000	1.176	0.000	0.001	0.000	0.015	0.000	0.002	0.884	0.088
	OWLObjectMinCardinality	864	0.466	1.276	0.466	0.021	0.466	0.019	0.466	0.020	0.293	0.090
	OWLObjectSomeValuesFrom	288	0.259	1.190	0.259	0.003	0.259	0.017	0.259	0.003	0.438	0.090
	OWLObjectUnionOf	1296	0.478	0.888	0.478	0.002	0.478	0.017	0.478	0.003	0.711	0.015

Table 9: Retrieval performance on the *Father* dataset with different levels of **noises**. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type.

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		Openllet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	3	1.000	0.003	1.000	0.003	1.000	0.003	1.000	0.003	1.000	0.001
	OWLObjectAllValuesFrom	12	0.167	0.008	0.167	0.002	0.167	0.003	0.167	0.007	1.000	0.002
	OWLObjectComplementOf	3	1.000	0.019	1.000	0.002	1.000	0.003	1.000	0.002	1.000	0.001
	OWLObjectIntersectionOf	36	1.000	0.032	0.889	0.006	1.000	0.005	0.889	0.003	1.000	0.001
	OWLObjectMaxCardinality	36	0.167	0.007	0.167	0.003	0.167	0.006	0.167	0.003	1.000	0.001
	OWLObjectMinCardinality	36	1.000	0.007	1.000	0.002	1.000	0.003	1.000	0.002	1.000	0.001
	OWLObjectSomeValuesFrom	12	1.000	0.008	1.000	0.003	1.000	0.003	1.000	0.002	1.000	0.001
	OWLObjectUnionOf	36	1.000	0.004	1.000	0.004	1.000	0.004	1.000	0.006	1.000	0.001
10	OWLClass	9	-	-	-	-	-	-	-	-	0.852	0.001
	OWLObjectAllValuesFrom	36	-	-	-	-	-	-	-	-	0.781	0.002
	OWLObjectComplementOf	9	-	-	-	-	-	-	-	-	0.861	0.001
	OWLObjectIntersectionOf	108	-	-	-	-	-	-	-	-	0.850	0.002
	OWLObjectMaxCardinality	108	-	-	-	-	-	-	-	-	0.963	0.002
	OWLObjectMinCardinality	108	-	-	-	-	-	-	-	-	0.749	0.002
	OWLObjectSomeValuesFrom	36	-	-	-	-	-	-	-	-	0.711	0.002
	OWLObjectUnionOf	108	-	-	-	-	-	-	-	-	0.888	0.002
20	OWLClass	9	-	-	-	-	-	-	-	-	0.744	0.001
	OWLObjectAllValuesFrom	36	-	-	-	-	-	-	-	-	0.647	0.002
	OWLObjectComplementOf	9	-	-	-	-	-	-	-	-	0.583	0.001
	OWLObjectIntersectionOf	108	-	-	-	-	-	-	-	-	0.707	0.002
	OWLObjectMaxCardinality	108	-	-	-	-	-	-	-	-	0.887	0.002
	OWLObjectMinCardinality	108	-	-	-	-	-	-	-	-	0.595	0.002
	OWLObjectSomeValuesFrom	36	-	-	-	-	-	-	-	-	0.562	0.002
	OWLObjectUnionOf	108	-	-	-	-	-	-	-	-	0.752	0.002
40	OWLClass	9	-	-	-	-	-	-	-	-	0.681	0.001
	OWLObjectAllValuesFrom	36	-	-	-	-	-	-	-	-	0.494	0.002
	OWLObjectComplementOf	9	-	-	-	-	-	-	-	-	0.389	0.001
	OWLObjectIntersectionOf	108	-	-	-	-	-	-	-	-	0.610	0.002
	OWLObjectMaxCardinality	108	-	-	-	-	-	-	-	-	0.686	0.002
	OWLObjectMinCardinality	108	-	-	-	-	-	-	-	-	0.532	0.002
	OWLObjectSomeValuesFrom	36	-	-	-	-	-	-	-	-	0.410	0.002
	OWLObjectUnionOf	108	-	-	-	-	-	-	-	-	0.662	0.002
80	OWLClass	9	-	-	-	-	-	-	-	-	0.667	0.001
	OWLObjectAllValuesFrom	36	-	-	-	-	-	-	-	-	0.389	0.002
	OWLObjectComplementOf	9	-	-	-	-	-	-	-	-	0.333	0.001
	OWLObjectIntersectionOf	108	-	-	-	-	-	-	-	-	0.583	0.002
	OWLObjectMaxCardinality	108	-	-	-	-	-	-	-	-	0.565	0.002
	OWLObjectMinCardinality	108	-	-	-	-	-	-	-	-	0.463	0.002
	OWLObjectSomeValuesFrom	36	-	-	-	-	-	-	-	-	0.375	0.002
	OWLObjectUnionOf	108	-	-	-	-	-	-	-	-	0.639	0.002

Table 10: Retrieval performance on the *Semantic Bible* dataset with different levels of **noises**. # represents the number of expression types generated, **Jac** and **RT** represent the average Jaccard similarity and average runtime in seconds on every concept type.

Ratio(%)	Concept Type	#	HermiT		Pellet		JFact		Openllet		EBR	
			Jac	RT	Jac	RT	Jac	RT	Jac	RT	Jac	RT
0	OWLClass	5	1.000	0.105	1.000	0.079	1.000	0.232	1.000	0.066	1.000	0.920
	OWLObjectComplementOf	5	0.027	19.699	0.027	0.061	0.027	0.201	0.027	0.065	0.903	2.533
	OWLObjectIntersectionOf	20	0.757	14.462	0.757	0.066	0.757	0.191	0.757	0.055	0.976	3.641
	OWLObjectUnionOf	20	0.757	5.095	0.757	0.089	0.757	0.211	0.757	0.082	0.928	1.774
10	OWLClass	2	-	-	-	-	-	-	-	-	0.637	1.069
	OWLObjectComplementOf	2	-	-	-	-	-	-	-	-	0.854	1.023
	OWLObjectIntersectionOf	8	-	-	-	-	-	-	-	-	0.873	2.210
	OWLObjectUnionOf	8	-	-	-	-	-	-	-	-	0.812	2.114
20	OWLClass	2	-	-	-	-	-	-	-	-	0.205	7.519
	OWLObjectComplementOf	2	-	-	-	-	-	-	-	-	0.783	7.254
	OWLObjectIntersectionOf	8	-	-	-	-	-	-	-	-	0.747	14.649
	OWLObjectUnionOf	8	-	-	-	-	-	-	-	-	0.692	14.387