

Queries used in the evaluation of the model \mathcal{ELKG}_{app}

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1 Introduction

This document presents the queries used in the datasets used to validate the model \mathcal{ELKG}_{app} with the EMSPARQL engine. All queries are in the EMSPARQL format. For more details see the paper [1].

2 BKR dataset

Q1 Find out the triples which are derived from $\langle \text{http://mor.nlm.nih.gov/bkr/PUBMED_99992-INST} \rangle$.

```
select ?s ?p ?o where { ?s ?p ?o ?i[.,(,)] ?i2. ?i <http://knoesis.wright.edu/provenir/derives_from> <http://mor.nlm.nih.gov/bkr/PUBMED\_99992-INST> ?i1[.,(,)] ?i3 .}
```

Q2 Find out the property value (object) for the entity $\langle \text{http://mor.nlm.nih.gov/umls/META_C0543467} \rangle$ connected to the relationship $\langle \text{http://mor.nlm.nih.gov/umls/SEMNET_TREATS} \rangle$ and find out the causes responsible for that object. Also find out the sources of these statements.

```
select ?o1 ?o2 ?i ?pmid2 where { <http://mor.nlm.nih.gov/umls/META\_C0543467> <http://mor.nlm.nih.gov/umls/SEMNET\_TREATS> ?o1 ?i[.,(,)] ?i2 . ?i <http://knoesis.wright.edu/provenir/derives_from> ?o ?i1[.,(,)] ?i5 . ?o1 <http://mor.nlm.nih.gov/umls/SEMNET\_CAUSES> ?o2 ?i3[.,(,)] ?i6 . ?i3 <http://knoesis.wright.edu/provenir/derives_from> ?pmid2 ?i4[.,(,)] ?i7 .}
```

Q3 Find out the property value (object) for the entity $\langle \text{http://mor.nlm.nih.gov/umls/META_C0543467} \rangle$ connected to the relationship $\langle \text{http://mor.nlm.nih.gov/umls/SEMNET_TREATS} \rangle$ and find out the causes responsible for that object. After that find out how those causes affect the entities. Find out the sources of these statements.

```
select ?o1 ?o2 ?i ?pmid2 ?o3 ?pmid3 where { <http://mor.nlm.nih.gov/umls/META\_C0543467> <http://mor.nlm.nih.gov/umls/SEMNET\_TREATS> ?o1 ?i[.,(,)] ?i9 . ?i <http://knoesis.wright.edu/provenir/derives_from> ?o ?i1[.,(,)] ?j1 . ?o1 <http://mor.nlm.nih.gov/umls/SEMNET\_CAUSES> ?o2 ?i3[.,(,)] ?j2 . ?i3 <http://knoesis.wright.edu/provenir/derives_from> ?pmid2 ?i4[.,(,)] ?j3 . ?o2 <http://mor.nlm.nih.gov/umls/SEMNET\_AFFECTS> ?o3 ?i5[.,(,)] ?j4 . ?i5 <http://knoesis.wright.edu/provenir/derives_from> ?pmid3 ?i6[.,(,)] ?j5 .} LIMIT 10
```

Q4 Find out the property value for the entity $\langle \text{http://mor.nlm.nih.gov/umls/META_C0006307} \rangle$ connected to the relationship $\langle \text{http://mor.nlm.nih.gov/umls/SEMNET_TREATS} \rangle$. Find out the sources of these statements.

```
select ?o ?i where { <http://mor.nlm.nih.gov/umls/META\_C0006307> <http://mor.nlm.nih.gov/umls/SEMNET\_TREATS> ?o ?i[.,(,)] ?i5 . ?i <http://knoesis.wright.edu/provenir/derives_from> ?o1 ?i1[.,(,)] ?i6 .}
```

Q5 Find out the source of the triple `<http://mor.nlm.nih.gov/umls/META_C0012963>`
`<http://mor.nlm.nih.gov/umls/SEMNET_STIMULATES>`
`<http://mor.nlm.nih.gov/umls/META_C0598981>`.

```
select ?o1 where { <http://mor.nlm.nih.gov/umls/META_C0012963> <http://mor.nlm.nih.gov/umls/SEMNET_STIMULATES>
<http://mor.nlm.nih.gov/umls/META_C0598981> ?i1 . ?i <http://knoesis.wright.edu/provenir/derives_from> ?o1 ?i2[,()] ?i3 . }
```

Q6 Find out the resource name and the property name whose property value is `<http://mor.nlm.nih.gov/umls/META_C0598981>`.

```
select ?sub ?pred where { ?sub ?pred <http://mor.nlm.nih.gov/umls/META_C0598981> ?i1[,()] ?i2 . }
```

Q7 Check the presence of the sources for the triples connected to `<http://mor.nlm.nih.gov/umls/SEMNET_CAUSES>`.

```
ASK{ ?o1 <http://mor.nlm.nih.gov/umls/SEMNET_CAUSES>[,()] ?o2 ?i3 ?j2 . ?i3 <http://knoesis.wright.edu/provenir/derives_from>[,()]
?pmid2 ?i4 ?j3 . }
```

3 Gov-track dataset

Q8 Find out all the bills and their actions with timestamp.

```
select ?s1 ?t1 ?o1 where { ?s1 <http://www.rdfabout.com/rdf/schema/usbill/hadAction> ?o1 ?i1[,?t1,()] ?i2 . } LIMIT 10
```

Q9 Find out all the US congress members and their role, between the years "1975" and "1976".

```
select ?s1 ?o1 where { ?s1 <http://www.rdfabout.com/rdf/schema/politico/hasRole> ?o1 ?i1[, (1975,1976)] ?i2 . }
```

Q10 Find out the actions of the bill
`<http://www.rdfabout.com/rdf/usgov/congress/106/bills/h1139>` having a timestamp "1999".

```
select ?o1 where { <http://www.rdfabout.com/rdf/usgov/congress/106/bills/h1139> <http://www.rdfabout.com/rdf/schema/usbill/hadAction>
?o1 ?i1[,1999,()] ?i2 . }
```

Q11 Find out the period of existence of the triple
`<http://www.rdfabout.com/rdf/usgov/congress/people/K000064>` `<http://www.rdfabout.com/rdf/schema/politico/hasRole>`
`<http://strabon.di.uoa.gr/blank_node/_node17cn1754hx23627>`.

```
select ?t1 ?t3 where { <http://www.rdfabout.com/rdf/usgov/congress/people/K000064> <http://www.rdfabout.com/rdf/schema/politico/hasRole>
<http://strabon.di.uoa.gr/blank_node/_node17cn1754hx23627> ?i1[, (?t1,?t3)] ?i2 . }
```

Q12 Find out the action of the bill `<http://www.rdfabout.com/rdf/usgov/congress/106/bills/hr168>` in the year "1999", and describe the action.

```
select ?o1 ?o2 where { <http://www.rdfabout.com/rdf/usgov/congress/106/bills/hr168> <http://www.rdfabout.com/rdf/schema/usbill/hadAction>
?o2 ?i1[,1999,()] ?i2 . ?o2 <http://purl.org/dc/elements/1.1/description> ?o1 ?i3[,()] ?i4 . }
```

Q13 Find out the bill which has the action `<http://strabon.di.uoa.gr/blank_node/_node17d3oknm3x29796>` in the year "1999".

```
select ?s1 where { ?s1 <http://www.rdfabout.com/rdf/schema/usbill/hadAction> <http://strabon.di.uoa.gr/blank_node/_node17d3oknm3x29796>
?i1[,1999,()] ?i2 . }
```

Q14 Find out all the subjects and objects connected to the `<http://www.rdfabout.com/rdf/schema/politico/hasRole>` predicate.

```
select ?sub ?obj where { ?sub <http://www.rdfabout.com/rdf/schema/politico/hasRole> ?obj ?i1[,()] ?i2 . }
```

4 Synthetic dataset

This dataset has two versions, one without meta-knowledge (MK), another one with MK.

4.1 Synthetic dataset without nested meta-knowledge.

Q15 Find out the name, nick name of the entity who knows `<http://example.org/objects/o1000020>` and also find out the source of the triple.

```
select ?i5 ?s1 ?o1 ?o3 ?o2 where { ?s1 <http://xmlns.com/foaf/0.1/knows> <http://example.org/objects/o1000020> ?i5[,()] ?i6 .
?s1 <http://xmlns.com/foaf/0.1/name> ?o1 ?i1[,()] ?i1 . ?s1 <http://xmlns.com/foaf/0.1/nick> ?o2 ?i2[,()] ?i3 .
?i5 <http://purl.org/biotop/biotop.owl#derivesFrom> ?o3 ?i7[,()] ?i4 . }
```

Q16 Find out the triples where entities know each other. Also find out the sources of the triples.

```
select ?s1 ?o1 ?i5 where { ?s1 <http://xmlns.com/foaf/0.1/knows> ?o1 ?i5[,()] ?i6 . ?i5 <http://purl.org/biotop/biotop.owl#derivesFrom> ?o3
?i7[,()] ?i4 . }
```

Q17 Find out the period of existence and the source of the triple `<http://example.org/subjects/s1>` `<http://xmlns.com/foaf/0.1/knows>`
`<http://example.org/objects/o1000013>`.

```
select ?o3 ?i5 ?t1 ?t3 where { <http://example.org/subjects/s1> <http://xmlns.com/foaf/0.1/knows> <http://example.org/objects/o1000013>
?i5[, (?t1,?t3)] ?i6 . ?i5 <http://purl.org/biotop/biotop.owl#derivesFrom> ?o3 ?i7[,()] ?i4 . }
```

Q18 Find out the certainty value, period of existence and source of the triple `<http://example.org/subjects/s2>`
`<http://xmlns.com/foaf/0.1/knows>` `<http://example.org/objects/o1000020>`.

```
select ?c ?i5 ?t1 ?t3 ?o3 where { <http://example.org/subjects/s2> <http://xmlns.com/foaf/0.1/knows> <http://example.org/objects/o1000020>
?i5[?c, (?t1,?t3)] ?i6 . ?i5 <http://purl.org/biotop/biotop.owl#derivesFrom> ?o3 ?i7[,()] ?i4 . }
```

4.2 Synthetic dataset with nested meta-knowledge.

Q19 Find out the certainty value and the source of the triple $\langle \text{http://example.org/subjects/s0} \rangle \langle \text{http://xmlns.com/foaf/0.1/knows} \rangle \langle \text{http://example.org/objects/o1000006} \rangle$.

```
select ?c ?i ?o2 where { <http://example.org/subjects/s0> <http://xmlns.com/foaf/0.1/knows> <http://example.org/objects/o1000006> ?i[?c,,)]
?i1 . ?i <http://purl.org/biotop/biotop.owl#derivesFrom> ?o2 ?i2[,,)] ?i3 . }
```

Q20 Find out the entities who know each other and the source of the statements.

```
select ?s1 ?o1 ?o2 where { ?s1 <http://xmlns.com/foaf/0.1/knows> ?o1 ?i[,,)] ?i1 . ?i <http://purl.org/biotop/biotop.owl#derivesFrom> ?o2
?i2[,,)] ?i3 . }
```

Q21 Check the presence of the source of the triple $\langle \text{http://example.org/subjects/s0} \rangle \langle \text{http://xmlns.com/foaf/0.1/knows} \rangle \langle \text{http://example.org/objects/o1000006} \rangle$.

```
ASK { <http://example.org/subjects/s0> <http://xmlns.com/foaf/0.1/knows> <http://example.org/objects/o1000006> ?i[,,)] ?i1 .
?i <http://purl.org/biotop/biotop.owl#derivesFrom> ?o2 ?i2[,,)] ?i3 . }
```

5 Dataset1 dataset

Q22 Find out the type of diseases and the causes of the diseases of the entities.

```
select ?disease where { ?s <http://rdf.ncbi.nlm.nih.gov/pubchem/vocabulary#causes> ?disease ?i[,,)] ?i1 . ?disease <http://www.w3.org/1999/02/22-
rdf-syntax-ns#type> ?o1 ?i6[,,)] ?i7 . } LIMIT 10
```

Q23 Find out the type of diseases and the causes of the diseases of the entity $\langle \text{http://rdf.ncbi.nlm.nih.gov/pubchem/compound/CID4946} \rangle$. Also find out the relation which provides assertion for the statement.

```
select ?rela1 ?i where { <http://rdf.ncbi.nlm.nih.gov/pubchem/compound/CID4946> <http://rdf.ncbi.nlm.nih.gov/pubchem/vocabulary#causes>
?disease ?i[,,)] ?i1 . ?disease <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> ?o1 ?i6[,,)] ?i7 .
?rela1 <http://purl.org/spar/cito/providesAssertionFor> ?i ?i2[,,)] ?i3 . } LIMIT 10
```

Q24 Check the type of diseases of the entities and the causes of the diseases.

```
ASK { ?s <http://rdf.ncbi.nlm.nih.gov/pubchem/vocabulary#causes> ?disease ?i[,,)] ?i1 . ?disease <http://www.w3.org/1999/02/22-rdf-syntax-
ns#type> ?o1 ?i6[,,)] ?i7 . }
```

Q25 Find out the diseases of the entity $\langle \text{http://rdf.ncbi.nlm.nih.gov/pubchem/compound/CID4946} \rangle$, and the causes of the diseases.

```
select ?disease where { <http://rdf.ncbi.nlm.nih.gov/pubchem/compound/CID4946> <http://rdf.ncbi.nlm.nih.gov/pubchem/vocabulary#causes>
?disease ?i[,,)] ?i1 . }
```

References

- [1] Sangeeta Sen, Mariana Curado Malta, Devashish Katoriya, Biswanath Dutta, and Animesh Dutta. \mathcal{ELKG}_{app} : An approach to represent multi-dimensional meta-knowledge in the web of data. *Expert Systems with Applications*, 2021 Under review.