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Advanced Databases and Information Systems
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4. Sheet: Graph Databases

Exercise 1 (Graphs & Evaluating SPARQL Queries)
Consider the RDF database

D := { (_:P1,rdf:type,Person), (_:P1,name,"Pete"), (_:P1,age,"17"), (_:P1,email,"pete@abc.com"),
(_:P2,rdf:type,Person), (_:P2,name,"John"), (_:P2,email,"john@abc.com"),
(_:P3,rdf:type,Person), (_:P3,name,"Sue"), (_:P3,age,"21"),
(_:P1,knows,_:P2), (_:P1,knows,_P3), (_:P2,knows,_:P1), (_:P2,knows,_:P3) }.

Draw the RDF graph and evaluate the following SPARQL graph patterns step by step according to the semantics introduced in the lecture and phrase their semantics in plain English. Assume that every of the following queries is preceded by the necessary namespace definitions and the Select * solution format.

a) `{ ?p rdf:type Person. ?p age ?age. FILTER (?age>20) }`

b) `{ { ?p rdf:type Person. ?p name ?name. } OPTIONAL { ?p age ?age . } }`

c) `{ { ?p rdf:type Person. ?p age ?age. } UNION { ?p rdf:type Person. ?p email ?email. } }`

d) `{ { ?p rdf:type Person. OPTIONAL ?p email ?email. } FILTER (!bound(?email)) }`

Exercise 2 (Graph Queries)
Consider the RDF & property graph databases from the previous exercise. Specify the following requests as SPARQL and Cypher queries, and indicate the final results obtained when evaluating them on the mentioned databases. You can, for example, test your queries with rdflib [1] by using `persons.n3` (available on ILIAS).

a) All pairs of distinct persons that have a common friend (i.e., it must hold that the intersection of persons they know is non-empty).

b) The names of all persons that know at least one person or are younger than 20 years. If present, the email address and, also if present, the age of this person should be included in the result.

c) All Persons, which are directly or indirectly connected via the knows-predicate.

d) All cyclic knows-relationships.

[1] `https://rdflib.readthedocs.io/en/stable/`