

Appendix A

User Help

In this documentation, we give a practical guideline about how a user can interact with the *CoMerger* tool. In particular, we present:

1. how to merge ontologies (Sec. [A.1](#)),
2. how to assess the quality of the merged ontology (Sec. [A.2](#)),
3. how to verify the consistency of the merged result (Sec. [A.3](#)),
4. how to check the compatibility of the selected Generic Merge Requirements (GMR)s (Sec. [A.4](#)),
5. how to compare the ontologies through the SPARQL endpoint (Sec. [A.5](#)).

A.1 Merging Ontologies

Figure A.1 shows the GUI of the ontology merging process in *CoMerger* tool. First, the MERGER tab should be selected. Then the required input parameters should be adjusted. To this end, a set of source ontologies and their mappings should be uploaded. If no mapping is available for them, the system can generate them automatically. The type of matcher and the format of output should be determined. Users can adjust a set of refinements and evaluation criteria to be applied to the created merged ontology. However, there is a possibility to perform them after the merge process as well. Finally, with pressing the MERGE button, the merged ontology will be generated.

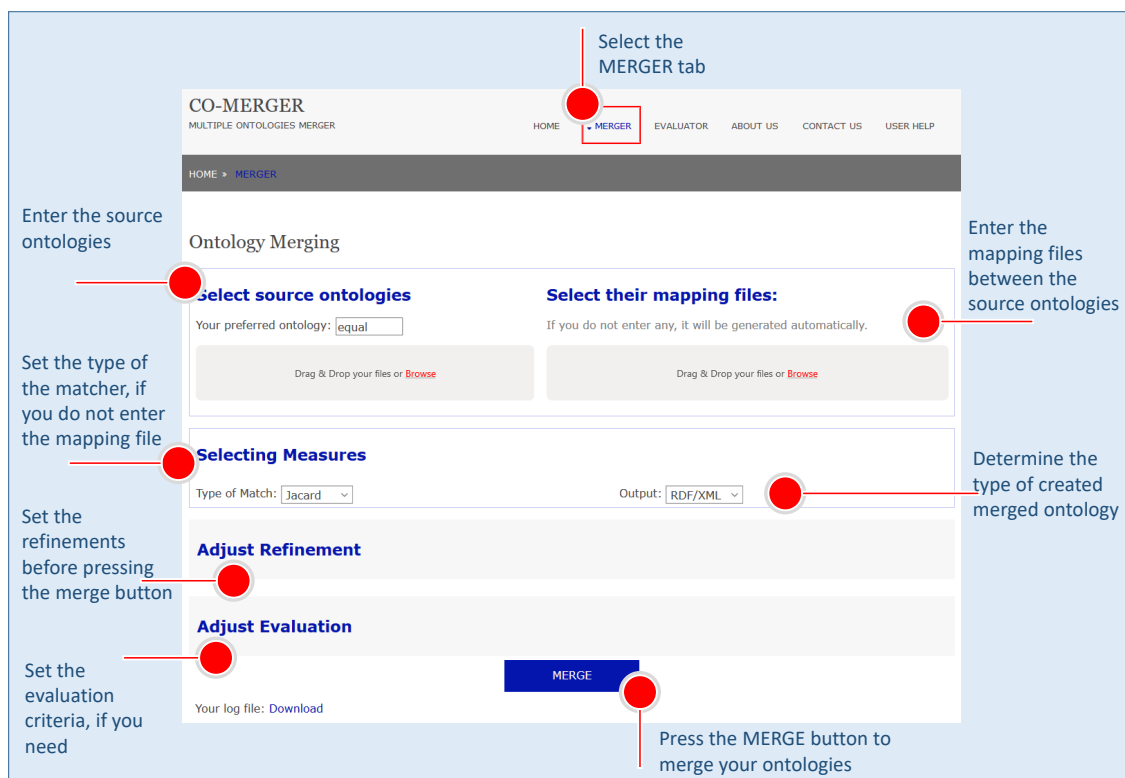


FIGURE A.1: Merger GUI.

After the merge process is performed, the users guide to the result page. In this page, the merged ontology, the created sub-ontologies, the log information on each step of refinements, and the evaluation result can be download, as shown in Figure A.2.

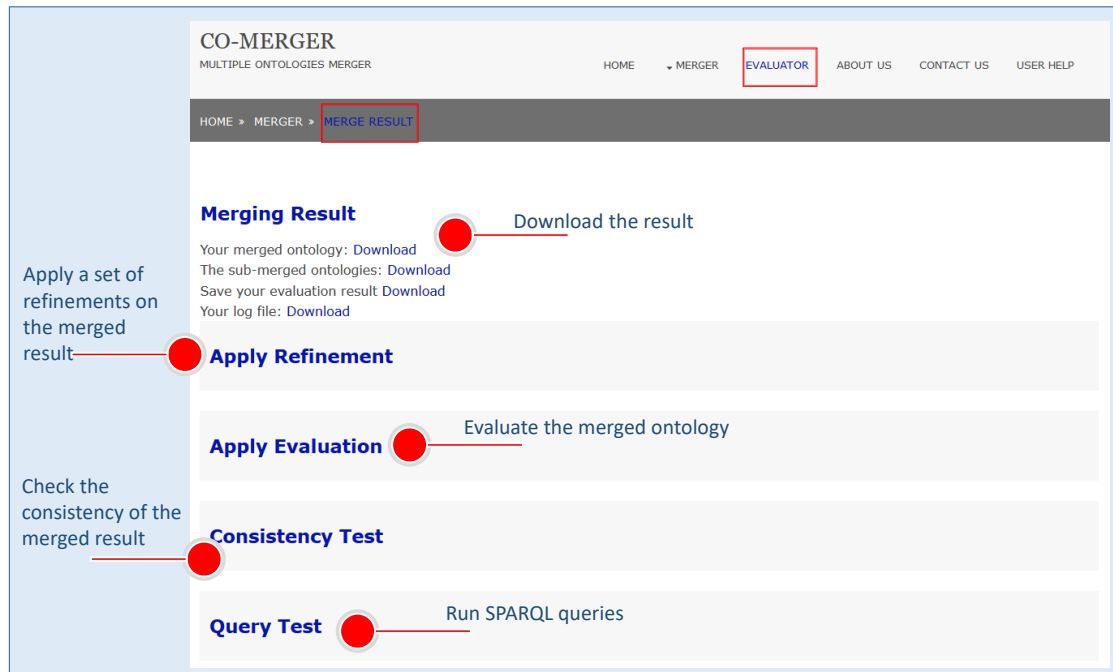


FIGURE A.2: Merging Result GUI.

A.2 Quality Assessment

Figure A.3 shows the setting for the evaluation criteria, and Figure A.4 presents the evaluation results.

Click here to span the detail of the criteria

Select or deselect all criteria together

Adjust Evaluation

[Select All] [Clear All]

GMR aspect evaluation

- ☐ Completeness Aspect
- ☐ Minimality Aspect
- ☐ Deduction Aspect
- ☐ Constraint Aspect
- ☐ Acyclicity Aspect
- ☐ Connectivity Aspect

Gernarl evaluation

- ☐ Mapping Analyzer
- ☐ Compactness
- ☐ Coverage
- ☐ Usability Profile

Select or deselect each metric separately

FIGURE A.3: Setting of the evaluation criteria.

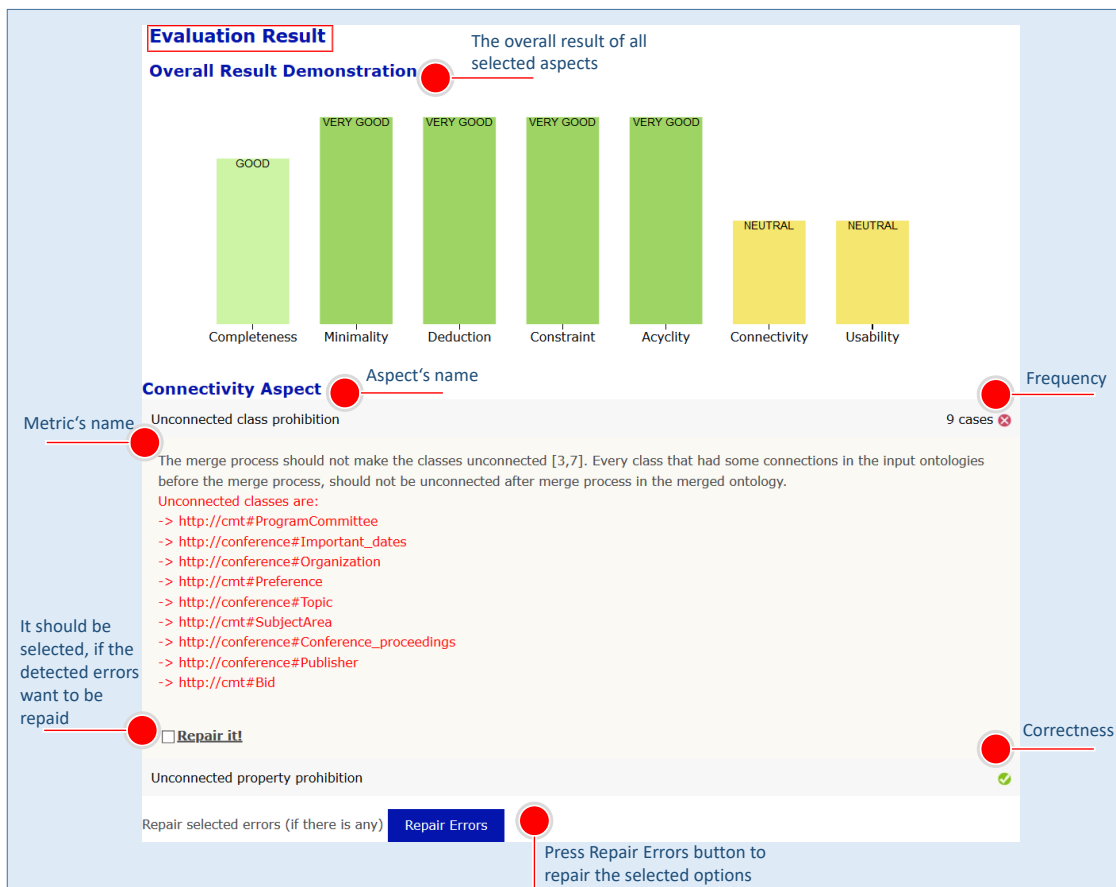


FIGURE A.4: Evaluation results.

Users are able to evaluate the quality of any given merged ontology directly. It does not require to run the merge before that. To this end, through the *Evaluator* tab, the quality of a merged ontology can directly be assessed, as shown in Figure A.5. The users can evaluate the merged result by adjusting the set of criteria, run a consistency test directly, or perform the query processing.

The screenshot shows the 'EVALUATOR' tab of the CO-MERGER application. The interface is divided into several sections for ontology evaluation. Red circles and lines are used to highlight specific features and provide instructions:

- Enter the source ontologies:** Points to the 'Select source ontologies' section, which includes a text input for 'Your preferred ontology' (set to 'equal') and a file upload area with a 'Browse' button.
- Enter the mapping files:** Points to the 'Select their mapping files' section, which includes a file upload area with a 'Browse' button.
- Enter the merged ontology that needs to be evaluated:** Points to the 'Enter the merged ontology:' section, which includes a file upload area with a 'Browse' button.
- Set the evaluation criteria:** Points to the 'GMR aspect evaluation' and 'Gernarl evaluation' sections. The GMR section includes checkboxes for Completeness Aspect, Minimality Aspect, Deduction Aspect, Constraint Aspect, Acyclicity Aspect, and Connectivity Aspect. The Gernarl section includes checkboxes for Mapping Analyzer, Compactness, Usability Profile, and Coverage.
- Set the parameters of the consistency test:** Points to the 'Consistency Test' section, which includes radio buttons for 'All Unsatisfiable Classes' and 'Only Root Classes', a 'Max Explanations' dropdown (set to 5), and a 'Test Consistency' button.
- Run one single query on the source and merged ontologies:** Points to the 'Query Test' section, which includes buttons for 'Test with single query!' and 'Test with several queries!'.
- Evaluate the merged result based on the selected criteria:** Points to the 'EVALUATE MERGE RESULT' button.
- Press the Test Consistency button, to run the consistency checker:** Points to the 'Test Consistency' button.
- Run several queries separately on the source or merged ontologies:** Points to the 'Test with several queries!' button.

FIGURE A.5: Evaluator GUI.

A.3 Consistency Checker

Figure A.6 shows the parameter setting before performing the consistency test. Figure A.7 presents the result of the consistency test.

Consistency Test

Parameters

☐ All Unsatisfiable Classes ☒ Only Root Classes

Max Explanations: 5

Set the required parameters

TEST CONSISTENCY!

Press TEST CONSISTENCY to run the test

FIGURE A.6: Parameter setting of consistency test.

CO-MERGER
MULTIPLE ONTOLOGIES MERGER

HOME MERGER EVALUATOR ABOUT US CONTACT US USER HELP

HOME » MERGER » MERGE RESULT » **CONSISTENCY RESULT**

Consistency Evaluation

Consistency Result **Result of consistency test**

Test with: Pellet

The satisfiability test: **FAILED**

Number of unsatisfiable classes: 2

Root of unsatisfiable classes: 2

Number of justifications: 6.0

Number of conflicting axioms: 33.0

Elapsed time:

Repair Plan

You need to revise below axioms.
The most untrustable axioms show on the top.

Axiom	Rank	Repair
<input checked="" type="checkbox"/> DisjointClasses([http://conference#Invited_talk] [http://conference#Regular_contribution])	0.001	<input checked="" type="radio"/> Delete <input type="radio"/> Rewrite
<input type="checkbox"/> EquivalentClasses([http://conference#Regular_contribution] ObjectUnionOf([http://conference#Extended_abstract] [http://merged#Paper]))	0.0	<input type="radio"/> Delete <input type="radio"/> Rewrite
<input type="checkbox"/> EquivalentClasses([http://conference#Invited_speaker] ObjectSomeValuesFrom([http://conference#contributes] [http://conference#Invited_talk]))	0.0	<input type="radio"/> Delete <input type="radio"/> Rewrite
<input type="checkbox"/> InverseObjectProperties([http://conference#contributes] [http://merged#has_authors])	0.0	<input type="radio"/> Delete <input type="radio"/> Rewrite
<input type="checkbox"/> ObjectPropertyDomain([http://merged#has_authors] [http://merged#Paper])	0.0	<input type="radio"/> Delete <input type="radio"/> Rewrite

Consistency Test:

Parameters

☐ All Unsatisfiable Classes ☒ Only Root Classes

Max Explanations: 5

Apply Repair Plan!

Apply the repair plan and test again whether the ontology will be consistent

FIGURE A.7: Consistency test result.

A.4 Compatibility Checker

Figure A.8 shows the compatibility checker test, and Figure A.9 shows a sample result of this test.

Click here to span the test

Adjust Refinement

Selecting Generic Merge Requirements

Set the number of system suggestions

Suggested compatible sets: 5

check Compatibility

Press the button to check the compatibility of the selected requirements

[Select All][Clear All] see rules description

Completeness Aspect

☐ R1. All (target) Classes Preservation

☐ R3. All (target) Instances Preservation

☐ R5. Correspondences' Property Preservation

☐ R7. Structure Preservation

Minimality Aspect

☐ R8. Class Redundancy Prohibition

☐ R10. Instance Redundancy Prohibition

Deduction Aspect

☐ R12. Entailment Deduction Satisfaction

Constraint Aspect

☐ R13. One Type Restriction

☐ R15. Property's Domain and Range Oneness

Acyclicity Aspect

☐ R16. Acyclicity in the Class Hierarchy

☐ R18. Prohibition of Properties being Inverses of Themselves

Connectivity Aspect

☐ R19. Unconnected Class Prohibition

☐ With Local Refinement

☐ R2. All (target) Properties Preservation

☐ R4. Correspondences Preservation

☐ R6. Property's Value Preservation

☐ R9. Property Redundancy Prohibition

☐ R11. Extraneous Entity Prohibition

☐ R14. Property's Value Constraint

☐ R17. Acyclicity in the Property Hierarchy

☐ R20. Unconnected Properties Prohibition

Select the desired requirements

FIGURE A.8: Compatibility checker GUI.

green: your compatible GMRs, red: your incompatible GMRs, orange: extra compatible GMRs

Suggested compatible sets: 5

check Compatibility

Guideline of color assumption

☒ The maximum compatible set: {1-2-3-4-6-7-8-20}, Incomaptible rules: {13}, Rank:0.9624

☐ The maximum compatible set: {1-3-4-8-20-22}, Incomaptible rules: {13}, Rank:0.9132

☐ The maximum compatible set: {1-2-6-8-12-20}, Incomaptible rules: {13}, Rank:0.904

☐ The maximum compatible set: {1-3-4-8-21-22}, Incomaptible rules: {13}, Rank:0.895

☐ The maximum compatible set: {1-8-12-20-22}, Incomaptible rules: {13}, Rank:0.8893

Suggested requirement sets

FIGURE A.9: Result of compatibility checker.

More information about GMRs can be achieved via the Requirement page. This is accessible under Merger submenu (see Figure A.10)

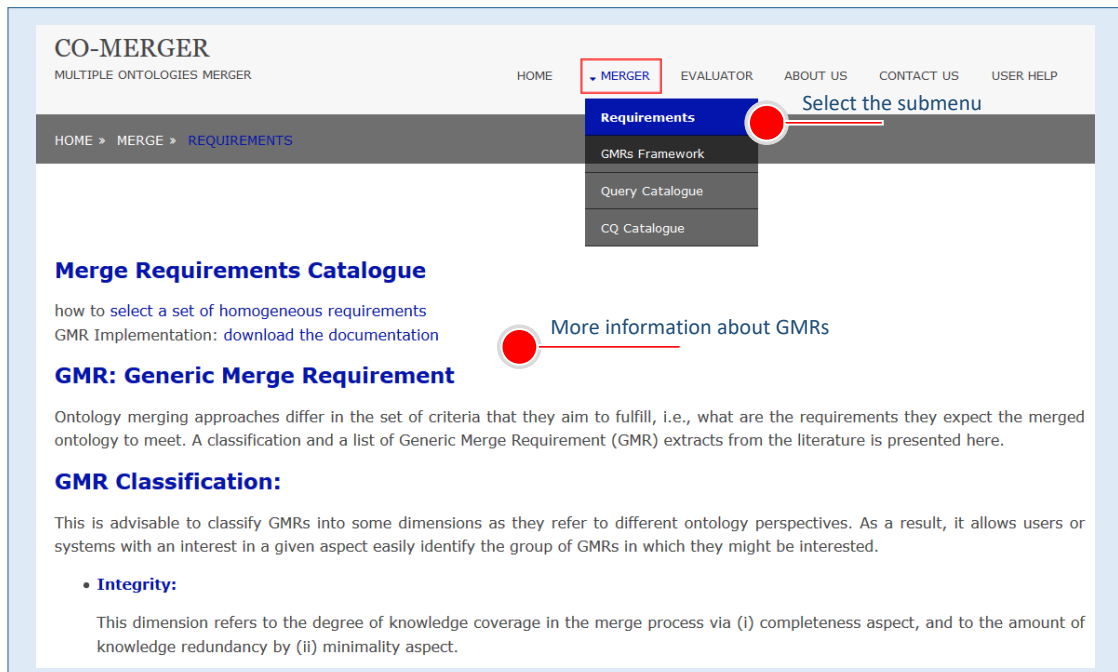


FIGURE A.10: Generic Merge Requirements (GMR)s information page

A.5 SPARQL Query Endpoint

Figure A.11 shows the detail of running a single SPARQL query both on the source and merged ontologies. Users can use ready templates or write their queries.

The screenshot shows the SPARQL Query Endpoint interface. It includes a 'Run Query' section with a 'See query catalog' link, a text area for writing queries, and a 'Run Query' button. Below this are two result panels: 'Result on merged ontology' and 'Result on ontology 1'. Red circles and lines highlight specific features: the 'Classes' dropdown, the 'Retrieve all classes' button, the query text area, the 'Run Query' button, the 'Result on merged ontology' panel, and the 'Result on ontology 1' panel. Annotations on the right side of the image point to these elements.

Run Query
See query catalog

Write one query, it will be run on the merged ontology and all source ontologies.

Query category:

Load template:

Write your query here

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT ?subject
WHERE { ?subject rdfs:subClassOf ?object }
```

Click here to run the query

Result on merged ontology

subject
<http://ekaw#Demo_Paper>
<http://ekaw#Camera_Ready_Paper>
<http://ekaw#Individual_Presentation>
<http://ekaw#Workshop_Chair>
<http://ekaw#Academic_Institution>
<http://ekaw#Scientific_Event>
<http://ekaw#Agency_Staff_Member>
<http://ekaw#Conference_Trip>
<http://ekaw#SC_Member>
<http://sigkdd#Exhibitor>
<http://ekaw#Accepted_Paper>
<http://sigkdd#Best_Paper_Awards_Committee>
<http://ekaw#Demo_Chair>
<http://sigkdd#Author_of_paper>
<http://sigkdd#Registration_fee>
<http://ekaw#Late-Registered_Participant>
<http://sigkdd#Gold_Supporter>
<http://ekaw#Camera_Ready_Paper>
<http://ekaw#Poster_Paper>
<http://ekaw#Proceedings>
<http://merged#InvitedSpeaker>
<http://merged#Person>
<http://sigkdd#Program_Committee_member>
<http://ekaw#Student>
<http://ekaw#Assigned_Paper>
<http://sigkdd#Author_of_paper_student>
<http://sigkdd#Registration_SIGMOD_Member>
<http://sigkdd#Hotel>
<http://sigkdd#Main_office>
<http://ekaw#PC_Member>
<http://ekaw#Negative_Review>
<http://ekaw#Web_Site>
<http://sigkdd#ACM_SIGKDD>
<http://ekaw#Rejected_Paper>
<http://sigkdd#Registration_Student>
<http://sigkdd#Organizing_Committee>

Result on ontology 1

subject
<http://sigkdd#Author>
<http://sigkdd#Deadline>
<http://sigkdd#Place>
<http://sigkdd#Abstract>
<http://sigkdd#Registration_Student>
<http://sigkdd#Paper>
<http://sigkdd#Committee>
<http://sigkdd#Award>
<http://sigkdd#Award>
<http://sigkdd#Sponsor>
<http://sigkdd#Silver_Supporter>
<http://sigkdd#Fee>
<http://sigkdd#Platinum_Supporter>
<http://sigkdd#Paper>

Result on ontology 2

subject
<http://sigkdd#Deadline>
<http://sigkdd#Place>
<http://sigkdd#Abstract>
<http://sigkdd#Author>
<http://sigkdd#Registration_Student>
<http://sigkdd#Committee>
<http://sigkdd#Award>
<http://sigkdd#Sponsor>
<http://sigkdd#Silver_Supporter>
<http://sigkdd#Fee>
<http://sigkdd#Platinum_Supporter>
<http://sigkdd#Speaker>
<http://sigkdd#Paper>
<http://sigkdd#Organizing_Committee>

Result of the source ontology

Result of the merged ontology

FIGURE A.11: Running a single query on the source and merged ontologies, simultaneously.

Figure A.12 shows the possibility of running different queries on the source or merged ontologies.

Write the same or different queries and run them separately

Run Query
See query catalog

on Merged Ontology

Query category:

Load template:

Write your query here

```

PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT ?subject
WHERE { ?subject rdfs:subClassOf ?object }
```

Click here to run the query on the merged ontology

Your result

subject
<http://ekaw#Web_Site>
<http://sigkdd#Registration_fee>
<http://merged#Abstract>
<http://merged#Location_Place>
<http://ekaw#Invited_Talk_Abstract>
<http://merged#Conference>
<http://ekaw#Invited_Talk_Abstract>
<http://ekaw#Event>
<http://ekaw#Programme_Brochure>
<http://sigkdd#Best_Student_Paper_Award>
<http://ekaw#Workshop>
<http://ekaw#Regular_Session>
<http://ekaw#Web_Site>
<http://merged#Paper>

Result of the merged ontology

on Source Ontologies

Query category:

Load template:

Query on ontology:

Write your query here

```

PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT ?sClass
WHERE { ?sClass rdfs:subClassOf ?object }
```

Click here to run the query on the selected source ontology

Your result

sClass
<http://sigkdd#Deadline>
<http://sigkdd#Place>
<http://sigkdd#Abstract>
<http://sigkdd#Registration_Student>
<http://sigkdd#Committee>
<http://sigkdd#Award>
<http://sigkdd#Sponsor>
<http://sigkdd#Silver_Supporter>
<http://sigkdd#Fee>
<http://sigkdd#Platinum_Supporter>
<http://sigkdd#Person>
<http://sigkdd#Paper>
<http://sigkdd#Speaker>
<http://sigkdd#Paper>

Result of the source ontology

FIGURE A.12: Running different queries on the source or merged ontologies, separately.