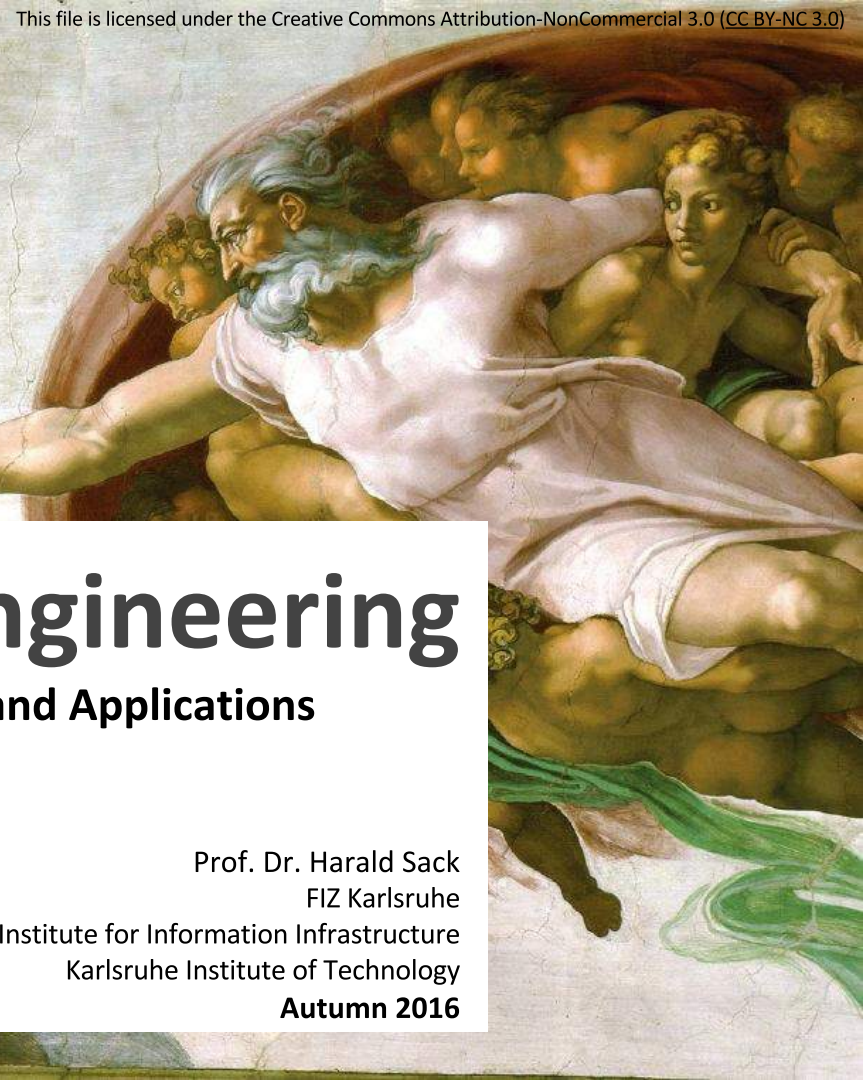




Lecture 5: Linked Data Mashups and Applications

5.4 Linked Data Programming

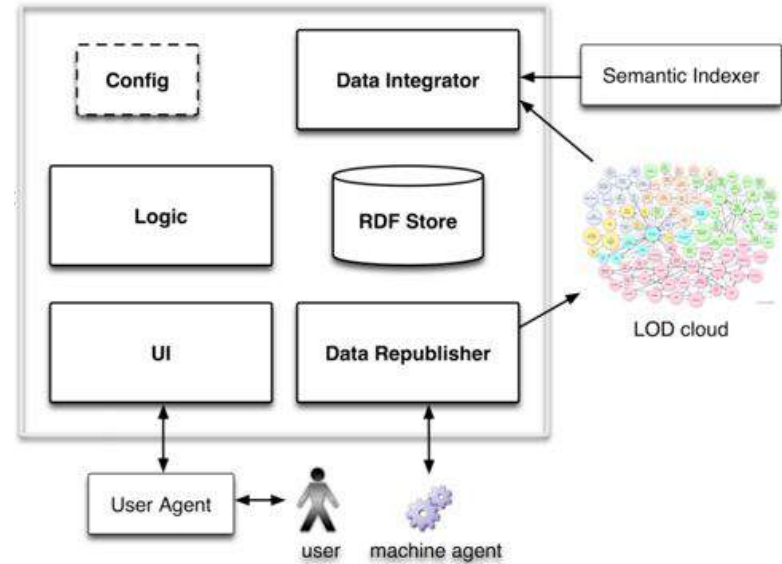


Leibniz Institute for Information Infrastructure
Karlsruhe Institute of Technology
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Linked Data Driven Web Applications

- Required Components:

- **Local RDF Store**
 - caching of results
 - permanent storage
- **Logic** (Controller) and
- **User Interface** (=Business Logic)
 - (not LOD specific)
- **Data Integration component**
 - get data directly from LOD-Cloud or
 - via Semantic Indexer
- **Data Re-/Publishing component**
 - write back application dependent data into the Web of Data



Linked Data Driven Web Applications

- The easiest way is to make use of a suitable library:
 - SPARQL Javascript Library
http://www.thefigtrees.net/lee/blog/2006/04/sparql_calendar_demo_a_sparql.html
 - ARC for SPARQL (PHP)
<https://github.com/semsol/arc2/wiki>
 - dotNetRDF (C#)
<https://dotnetrdf.github.io/>
 - Jena/ARQ (Java)
<http://jena.apache.org/>
 - Sesame (Java)
<http://rdf4j.org/>
 - **SPARQL Wrapper (Python)**
<http://rdflib.github.io/sparqlwrapper/>

Linked Data Programming Example

- The easiest way is to make use of a suitable library:
 - **SPARQL Wrapper (Python)**
<http://rdflib.github.io/sparqlwrapper/>
- Access to Linked Data via **SPARQL endpoints**
 - let's choose **DBpedia** (just for simplicity...)
<http://dbpedia.org/sparql>
- ...now we have to think of a simple example...

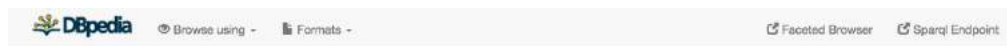
Linked Data Programming Example

- **Example Application:**

- Build a simple application that looks for **today's birthdays** of famous people, as e.g. **Authors**
- Create a **list of authors**, whose birthday is today including some **additional information**, as e.g.
 - Year of Birth
 - Short description
- Let's create a simple (local) **web page** for the task, which can be displayed in the browser
- we use **Python** and the **SPARQL Wrapper library**

Prerequisites - (Manual) Data Analysis

- Choose a representative example:
 - E.g. **Alexandre Dumas** from **DBpedia**



About: Alexandre Dumas

An Entity of Type : person, from Named Graph : <http://dbpedia.org>, within Data Space : dbpedia.org

Alexandre Dumas (French: [a.lɛk.sɑ̃dʁ dy.ma], born Dumas Davy de la Pailleterie [dy.ma da.vi de la pa.jɛ.tɛʁi]; 24 July 1802 – 5 December 1870), also known as Alexandre Dumas, père, was a French writer. His works have been translated into nearly 100 languages, and he is one of the most widely read French authors.

Property	Value
dbpedia:abstract	- Alexandre Dumas der Ältere (auch Alexandre Dumas Davy de la Pailleterie oder Alexandre Dumas père; * 24. Juli 1802 in Villers-Cotterêts, Département Aisne; † 5. Dezember 1870 in Puy bei Dieppe, Seine-Maritime) war ein französischer Schriftsteller. Heute ist er vor allem durch seine zu Klassikern gewordenen Historienromane bekannt, etwa Die drei Musketiere und Der Graf von Monte Cristo. (see) - Alexandre Dumas (French: [a.lɛk.sɑ̃dʁ dy.ma], born Dumas Davy de la Pailleterie [dy.ma da.vi de la pa.jɛ.tɛʁi]; 24 July 1802 – 5 December 1870), also known as Alexandre Dumas, père, was a French writer. His works have been translated into nearly 100 languages, and he is one of the most widely read French authors. Many of his historical novels of high adventure were originally published as serials, including The Count of Monte Cristo, The Three Musketeers, Twenty Years After, and The Vicomte de Bragelonne: Ten Years Later. His novels have been adapted since the early twentieth century for nearly 200 films. Dumas' last novel, The Knight of Sainte-Hermine, unfinished at his death, was completed by a scholar and published in 2005, becoming a bestseller. It was published in English in 2008 as The Last Cavalier. Prolific in several genres, Dumas began his career by writing plays, which were successfully produced from the first. He also wrote numerous magazine articles and travel books; his published works totaled 100,000 pages. In the 1840s, Dumas founded the Théâtre Historique in Paris. Dumas' father (General Thomas-Alexandre Davy de la Pailleterie) was born in Saint-Domingue (present-day Haiti) to a French nobleman and an enslaved African woman. At age 14 Thomas-Alexandre was taken by his father to France, where he was educated in a military academy and entered the military for what became an illustrious career. His father's aristocratic rank helped young Alexandre acquire work with Louis-Philippe, Duke of Orléans. He later began working as a writer, finding early success. Decades later, in the election of Louis-Napoléon Bonaparte in 1851, Dumas fell from favor and left France for Belgium, where he stayed for several years. Upon leaving Belgium Dumas moved to Russia for a few years before going to Italy. In 1861 he founded and published the newspaper L'Indépendante, which supported the Italian unification effort. In 1864 he returned to Paris. Though married, in the tradition of Frenchmen of higher social class, Dumas had numerous affairs (allegedly as

http://dbpedia.org/page/Alexandre_Dumas

Prerequisites - (Manual) Data Analysis

- Data Analysis via **SPARQL**
 - What kind of entities are you looking for?
 - `?author rdf:type dbo:Writer .`
 - What information do you need?
 - `?author dbo:birthDate ?birthdate .`
 - `?author rdfs:label ?name .`
 - `?author rdfs:comment ?description .`
 - `OPTIONAL { ?author dbo:thumbnail ?thumbnail }`
 - Any filter criteria?
 - `(lang(?name)="en") && (lang(?description)="en")`
 - `(SUBSTR(STR(?birthdate),6)="11-04")`
 - More sophisticated: `(SUBSTR(STR(bif:curdate('')),6)`

Prerequisites - SPARQL Queries

Virtuoso SPARQL Query Editor

[About](#) | [Namespace Prefixes](#) | [Inference rules](#) | [iSPARQL](#)

Default Data Set Name (Graph IRI)

Query Text

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dc: <http://purl.org/dc/elements/1.1/>

SELECT distinct ?birthdate ?thumbnail ?author ?name ?description WHERE {
?author rdf:type dbo:Writer ;
        dbo:birthDate ?birthdate ;
        rdfs:label ?name ;
        dc:description ?description
FILTER ((lang(?name)="en")&&(lang(?description)="en")&&(STRLEN(STR(?birthdate))>6)&&(SUBSTR(STR(?birthdate),6)=SUBSTR(STR(bif:curdate('')),6))) .
OPTIONAL { ?author dbo:thumbnail ?thumbnail . }
} ORDER BY ?birthdate
```

(Security restrictions of this server do not allow you to retrieve remote RDF data, see [details](#).)

Results Format:

Execution timeout:

milliseconds (values less than 1000 are ignored)

Options:

☒ Strict checking of void variables ☐ Log debug info at the end of output (has no effect on some queries and output formats)

(The result can only be sent back to browser, not saved on the server, see [details](#))

[SPARQL query at dbpedia.org](#)

Prerequisites - Download & Install

- You should have Python installed on your computer
 - <https://www.python.org/downloads/>
- Download SPARQL Wrapper for Python
 - <http://rdflib.github.io/sparqlwrapper/>
- Follow the instructions for Installation

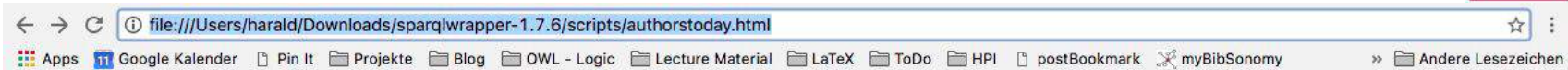


```
Macintosh-4:sparqlwrapper-1.7.6 harald$ ls
AUTHORS.md      MANIFEST.in      SPARQLWrapper.egg-info  ez_setup.pyc      setup.py
ChangeLog.txt   Makefile         build                  requirements.txt   test
LICENSE.txt     README.md        dist                  run_tests_py3.sh  tests.sh
MANAGEMENT.md   SPARQLWrapper   ez_setup.py           scripts
```

example_02.py x

```
1 #!/usr/bin/python
2 # -*- coding: utf-8 -*-
3
4 import urllib2
5 from datetime import datetime
6 from SPARQLWrapper import SPARQLWrapper, JSON, XML, N3, RDF
7
8 sparql = SPARQLWrapper("http://dbpedia.org/sparql")
9
10 sparql.setQuery("""
11 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
12 PREFIX dbo: <http://dbpedia.org/ontology/>
13 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
14 PREFIX dc: <http://purl.org/dc/elements/1.1/>
15
16 Select distinct ?birthdate ?thumbnail ?author ?name ?description WHERE {
17   ?author rdf:type dbo:Writer ;
18           dbo:birthDate ?birthdate ;
19           rdfs:label ?name ;
20           dc:description ?description
21   FILTER ((lang(?name)="en")&&(lang(?description)="en")&&(STRLEN(STR(?birthdate))>6)&&(SUBSTR(STR(?birthdate),6)=SUBSTR(STR(bif:curdate('')),6))) .
22   OPTIONAL { ?author dbo:thumbnail ?thumbnail . }
23 } ORDER BY ?birthdate
24 """)
25
26 sparql.setReturnFormat(JSON)
27 results = sparql.query().convert()
28
29 # Create HTML output
30 print '<html><head><title>Literary Birthdays of Today</title></head>'
31
32 #extract Weekday %A / Month %B / Day of the Month %d by formatting today's date accordingly
33 datum = datetime.today().strftime("%A %B %d")
34 print '<body><h1>Literary Birthdays of {}</h1>'.format(datum)
35
36 print '<ul>'
37
38 for result in results["results"]["bindings"]:
39     if ("author" in result):
40         #Create Wikipedia Link
41         wikiurl = "http://en.wikipedia.org/wiki/" + result["author"]["value"].encode('ascii', 'ignore').split('/')[~1]
42     else:
43         wikiurl = 'NONE'
44     if ("name" in result):
45         name = result["name"]["value"].encode('ascii', 'ignore')
46     else:
47         name = 'NONE'
48     if ("birthdate" in result):
49         date = result["birthdate"]["value"].encode('ascii', 'ignore')
50     else:
51         date = 'NONE'
52     if ("description" in result):
```

Linked Data Programming Example



Literary Birthdays of Friday November 04

- 
 • 1658 -- [Sulkhan-Saba Orbeliani](#), Prince Sulkhan-Saba Orbeliani (Georgian: -) (1658-1725) was a Georgian writer and diplomat. Orbeliani is noted in part due to his important role as an emissary of Georgia to France and Vatican, where he sought assistance on behalf of his beleaguered King Vakhtang VI to no avail. In modern-day Georgia, the story of Orbeliani's diplomatic mission to France would become a symbol of how the West neglects Georgian appeals for assistance.
- 
 • 1769 -- [Charles-Julien Lioult de Chnedoll](#), Charles-Julien Lioult de Chnedoll (4 November 1769 2 December 1833) was a French poet.
- 
 • 1771 -- [James Montgomery \(poet\)](#), James Montgomery (4 November 1771 30 April 1854) was a British poet, hymnwriter and editor. He was particularly associated with humanitarian causes such as the campaigns to abolish slavery and to end the exploitation of child chimney sweeps.
- 
 • 1779 -- [John Hodgson \(antiquary\)](#), John Hodgson (17791845) was an English clergyman and antiquary, known as the county historian of Northumberland.
- 
 • 1793 -- [Charles Magnin](#), Charles Magnin (born in Paris, November 4, 1793; died there, October 7, 1862) was a French author.
- 
 • 1801 -- [Kathinka Zitz-Halein](#), Kathinka Zitz (ne Halein; November 4, 1801 March 8, 1877) was a German writer. On June 3, 1837, she married a distant relative, the prominent Mainz attorney and 1848 revolutionary Dr. Franz Heinrich Zitz. They lived together for two years.
- 
 • 1802 -- [George William Johnson \(writer\)](#), George William Johnson (4 November 1802 29 October 1886), was a British writer on gardening.

- **Alternative:** simple example with Jena ARQ and Java:

```
import com.hp.hpl.jena.query.*;

String service = "..."; // address of the SPARQL endpoint
String query = "SELECT ..."; // your SPARQL query
QueryExecution e = QueryExecutionFactory. sparqlService(service, query)

ResultSet results = e.execSelect();
while ( results.hasNext() ) {
    QuerySolution s = results.nextSolution();
    // ...
}

e.close();
```



Next: 05 - Linked Data Visualization

Lecture 5 - Linked Data Mashups & Applications - OpenHPI - Course Linked Data Engineering