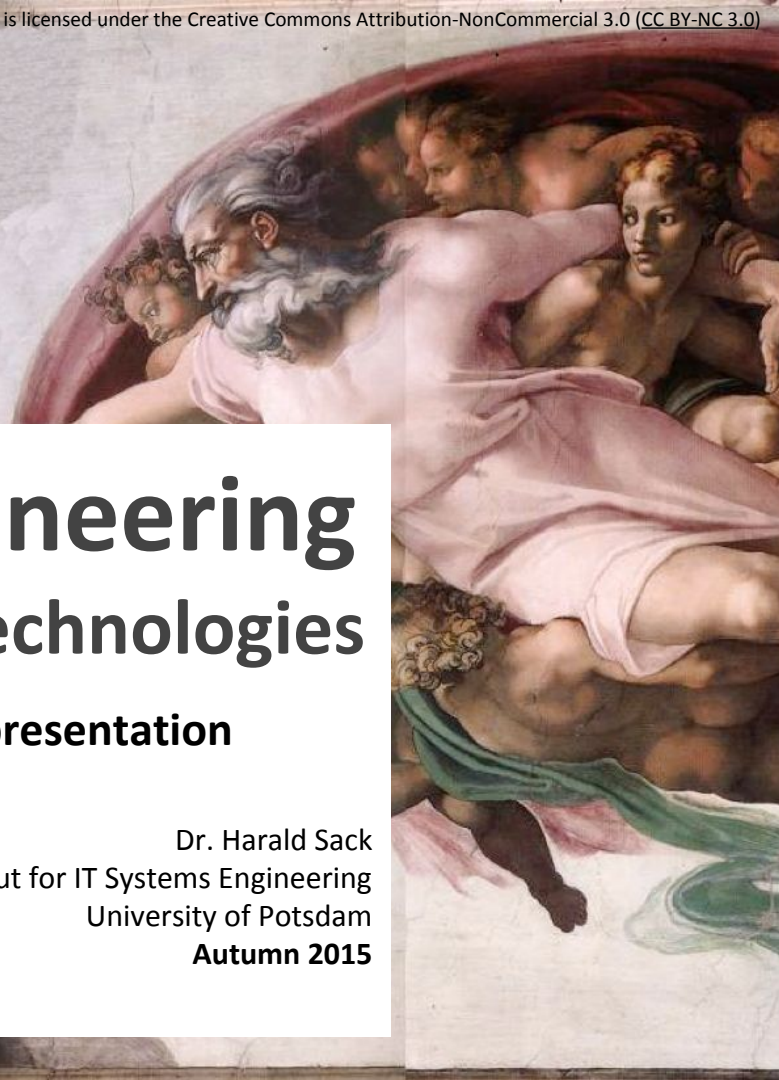
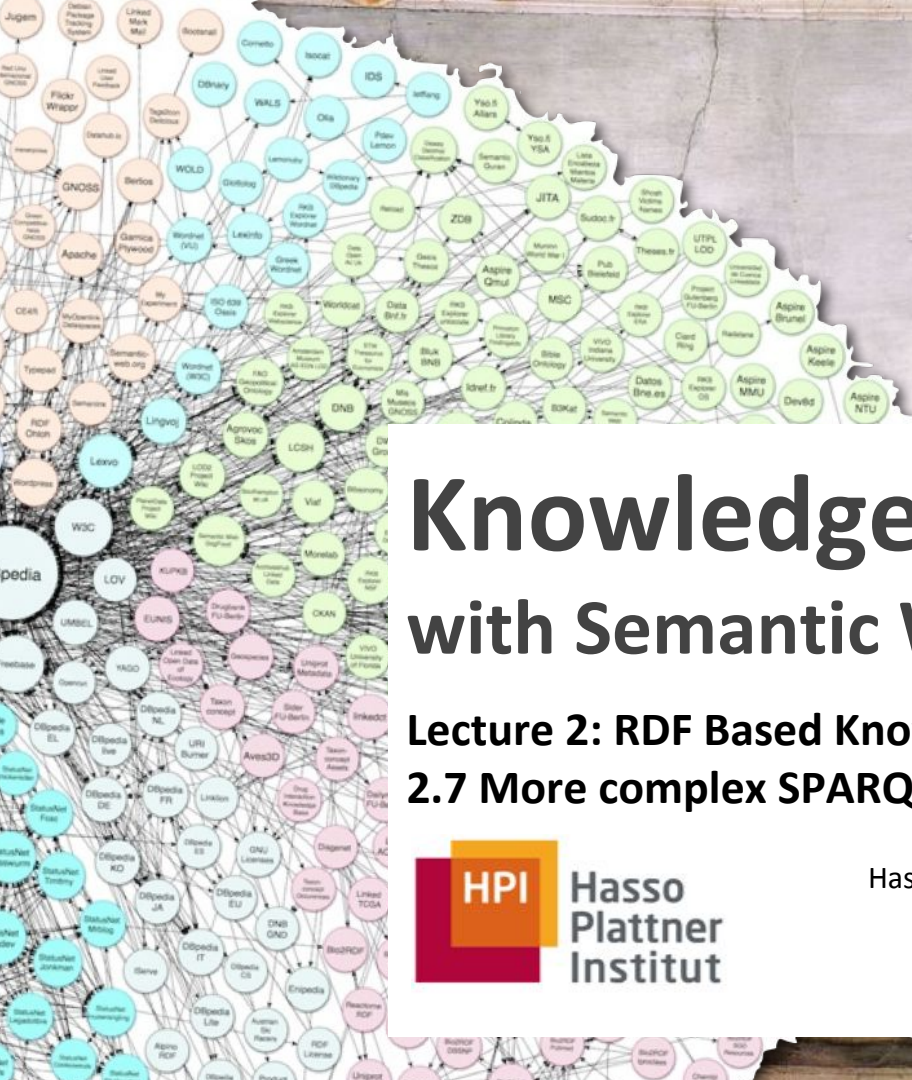




Knowledge Engineering with Semantic Web Technologies

Lecture 2: RDF Based Knowledge Representation 2.7 More complex SPARQL queries



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Autumn 2015

SPARQL - Variable Assignments

- Example: Select all authors with their notable works and year of publication

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
```

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
```

```
PREFIX dbo: <http://dbpedia.org/ontology/>
```

```
PREFIX dbp: <http://dbpedia.org/property/>
```

```
SELECT ?author ?work ?date
```

```
FROM <http://dbpedia.org/>
```

```
WHERE {
```

```
    ?author rdf:type dbo:Writer .
```

```
    ?author dbo:notableWork ?work .
```

```
    ?work dbp:releaseDate ?date
```

```
} ORDER BY ?date
```

```
LIMIT 100
```

author	work	date
http://dbpedia.org/resource/John_Crowley	http://dbpedia.org/resource/Engine_Summer	http://dbpedia.org/resource/1979_in_literature
http://dbpedia.org/resource/John_Crowley	http://dbpedia.org/resource/Little_Big	http://dbpedia.org/resource/1981_in_literature
http://dbpedia.org/resource/Beverly_Cleary	http://dbpedia.org/resource/Dear_Mr._Henshaw	http://dbpedia.org/resource/1983_in_literature
http://dbpedia.org/resource/Roald_Dahl	http://dbpedia.org/resource/Charlie_and_the_Chocolate_Factory	"* 1964 * 1967"@en
http://dbpedia.org/resource/Helen_Hooven_Santmyer	http://dbpedia.org/resource/%22...And_Ladies_of_the_Club%22	"* 1982 * 1984 * 1985"@en
http://dbpedia.org/resource/Suetonius	http://dbpedia.org/resource/The_Twelve_Caesars	"AD 121"@en
http://dbpedia.org/resource/Daniel_Keves	http://dbpedia.org/resource/Flowers_for_Algeron	"April 1959"@en
http://dbpedia.org/resource/Charlotte_Perkins_Gilman	http://dbpedia.org/resource/Herland_(novel)	"April 1979"@en
http://dbpedia.org/resource/Warren_Adler	http://dbpedia.org/resource/The_War_of_the_Roses_(novel)	"April 1981"@en
http://dbpedia.org/resource/David_Eddings	http://dbpedia.org/resource/The_Belgariad	"April 1982"@en
http://dbpedia.org/resource/Cormac_McCarthy	http://dbpedia.org/resource/Blood_Meridian	"April 1985"@en
http://dbpedia.org/resource/Daniel_Pinkwater	http://dbpedia.org/resource/Borge	"April 1990"@en
http://dbpedia.org/resource/Patrick_McCabe_(novelist)	http://dbpedia.org/resource/The_Butcher_Boy_(novel)	"April 1992"@en
http://dbpedia.org/resource/Nancy_Farmer	http://dbpedia.org/resource/The_Ear,_the_Eve_and_the_Arm	"April 1994"@en
http://dbpedia.org/resource/Margaret_Clark_(writer)	http://dbpedia.org/resource/Fat_Chance_(Margaret_Clark_novel)	"April 1996"@en
http://dbpedia.org/resource/Daniel_Handler	http://dbpedia.org/resource/The_Basic_Eight	"April 1998"@en
http://dbpedia.org/resource/John_Peel_(writer)	http://dbpedia.org/resource/Legacy_of_the_Daleks	"April 1998"@en
http://dbpedia.org/resource/Julian_Stockwin	http://dbpedia.org/resource/Kydd_(novel)	"April 2001"@en
http://dbpedia.org/resource/Brian_Keene	http://dbpedia.org/resource/The_Rising_(Keene_novel)	"April 2003"@en
http://dbpedia.org/resource/Dan_Brown	http://dbpedia.org/resource/The_Da_Vinci_Code	"April 2003"@en
http://dbpedia.org/resource/Frans_Sammut	http://dbpedia.org/resource/The_Da_Vinci_Code	"April 2003"@en
http://dbpedia.org/resource/Cecelia_Ahern	http://dbpedia.org/resource/PS_I_Love_You_(novel)	"April 2004"@en
http://dbpedia.org/resource/G._B._Singh	http://dbpedia.org/resource/Gandhi_Behind_the_Mask_of_Divinity	"April 2004"@en
http://dbpedia.org/resource/David_Mitchell_(author)	http://dbpedia.org/resource/Black_Swan_Green	"April 2006"@en
http://dbpedia.org/resource/Carole_Wilkinson	http://dbpedia.org/resource/Dragon_Moon	"April 2007"@en
http://dbpedia.org/resource/Joan_London_(Australian_author)	http://dbpedia.org/resource/The_Good_Parents	"April 2008"@en
http://dbpedia.org/resource/Hal_Clement	http://dbpedia.org/resource/Mission_of_Gravity	"April–July 1953 & 1954"@en
http://dbpedia.org/resource/Arthur_C._Clarke	http://dbpedia.org/resource/Rendezvous_with_Rama	"Aug 1973"@en
http://dbpedia.org/resource/Guy_Gavriel_Kay	http://dbpedia.org/resource/Tigana	"August 1990"@en
http://dbpedia.org/resource/David_Wellington_(author)	http://dbpedia.org/resource/Monster_Island_(Wellington_novel)	"August 2004 April 2006"@en
http://dbpedia.org/resource/Ariel_Levy	http://dbpedia.org/resource/Female_Chauvinist_Pigs	"August 2005"@en
http://dbpedia.org/resource/Premchand	http://dbpedia.org/resource/Bazaar-e-Husn	"Calcutta and Lahore"@en
http://dbpedia.org/resource/Henry_James	http://dbpedia.org/resource/The_Wings_of_the_Dove	"Constable: 30-Aug-1902"@en
http://dbpedia.org/resource/Laurence_Sterne	http://dbpedia.org/resource/The_Life_and_Opinions_of_Tristram_Shandy,_Gentleman	"December 1759 – January 1767"@en
http://dbpedia.org/resource/Henri_Barbusse	http://dbpedia.org/resource/Under_Fire_(novel)	"December 1916"@en
http://dbpedia.org/resource/David_Eddings	http://dbpedia.org/resource/The_Belgariad	"December 1984"@en
http://dbpedia.org/resource/Naoimh_Klein	http://dbpedia.org/resource/No_Logo	"December 1999"@en
http://dbpedia.org/resource/J._D._Salinger	http://dbpedia.org/resource/Franny_and_Zooey	"Fall 1961"@en
http://dbpedia.org/resource/James_Fenimore_Cooper	http://dbpedia.org/resource/The_Last_of_the_Mohicans	"February 1826"@en
http://dbpedia.org/resource/Joseph_Conrad	http://dbpedia.org/resource/Heart_of_Darkness	"February 1899"@en
http://dbpedia.org/resource/Joanna_Russ	http://dbpedia.org/resource/The_Female_Man	"February 1975"@en
http://dbpedia.org/resource/Dean_Koontz	http://dbpedia.org/resource/Watchers_(novel)	"February 1987"@en
http://dbpedia.org/resource/Sharon_Carter_Rogers	http://dbpedia.org/resource/Drift_(novel)	"February 2002"@en
http://dbpedia.org/resource/Abraham_Vergheze	http://dbpedia.org/resource/Cutting_for_Stone	"February 2009"@en
http://dbpedia.org/resource/Shimun_Vrochek	http://dbpedia.org/resource/Piter_(novel)	"February 2010"@en
http://dbpedia.org/resource/Amish_Trinathi	http://dbpedia.org/resource/The_Immortals_of_Meluha	"February 2010"@en

SPARQL - Variable Assignments

- Example: Select all authors with their notable works and year of publication

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX dbp: <http://dbpedia.org/property/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
```

```
SELECT ?author ?work xsd:integer(?date) AS ?year
FROM <http://dbpedia.org/>
WHERE {
    ?author rdf:type dbo:Writer .
    ?author dbo:notableWork ?work .
    ?work dbp:releaseDate ?date
} ORDER BY DESC(?year)
LIMIT 100
```

new variable
assignment

author	work	year
http://dbpedia.org/resource/W._Stanley_Moss	http://dbpedia.org/resource/111_Met_by_Moonlight	9223372036854775807
http://dbpedia.org/resource/Frank_Mentzer	http://dbpedia.org/resource/Dungeons&Dragons_Basic_Set	1977198119831991
http://dbpedia.org/resource/Richard_A._Lupoff	http://dbpedia.org/resource/Master_of_Adventure:_The_Worlds_of_Edgar_Rice_Burroughs	1965196819752005
http://dbpedia.org/resource/Noriko_Ogiwara	http://dbpedia.org/resource/The_Jade_TriLOGY	198819911996
http://dbpedia.org/resource/W._Stanley_Moss	http://dbpedia.org/resource/A_War_of_Shadows	195220142014
http://dbpedia.org/resource/Dan_Wells_(author)	http://dbpedia.org/resource/I_Am_Not_a_Serial_Killer	20092010
http://dbpedia.org/resource/Joan_Brady_(American-British_writer)	http://dbpedia.org/resource/Theory_of_War	19921993
http://dbpedia.org/resource/Sita_Ram_Goel	http://dbpedia.org/resource/Catholic_Ashrams	19881994
http://dbpedia.org/resource/Sita_Ram_Goel	http://dbpedia.org/resource/The_Story_of_Islamic_Imperialism_in_India	19821994
http://dbpedia.org/resource/Graham_Swift	http://dbpedia.org/resource/Shuttlecock_(novel)	19811985
http://dbpedia.org/resource/Frank_Mentzer	http://dbpedia.org/resource/Dungeons_&_Dragons_Expert_Set	19811983
http://dbpedia.org/resource/Edna_O'Brien	http://dbpedia.org/resource/Casualties_of_Peace	19661967
http://dbpedia.org/resource/Lydia_Chukovskaya	http://dbpedia.org/resource/Sofia_Petrovna	19651967
http://dbpedia.org/resource/Hermann_Hesse	http://dbpedia.org/resource/Siddhartha_(novel)	19222010
http://dbpedia.org/resource/Hermann_Hesse	http://dbpedia.org/resource/Siddhartha_(novel)	19221951
http://dbpedia.org/resource/Claire_de_Duras	http://dbpedia.org/resource/Ourika	18231824
http://dbpedia.org/resource/Kovid_Gupta	http://dbpedia.org/resource/Kingdom_of_The_Soap_Queen:_The_Story_of_Balaji_Telefilms	2014
http://dbpedia.org/resource/Devikumar_Ramalingam	http://dbpedia.org/resource/The_Celestial_Hunt	2014
http://dbpedia.org/resource/Kovid_Gupta	http://dbpedia.org/resource/Redrawing_India:_The_Teach_For_India_Story	2014
http://dbpedia.org/resource/John_King_(author)	http://dbpedia.org/resource/Headhunters_(novel)	2013
http://dbpedia.org/resource/Alissa_Nutting	http://dbpedia.org/resource/Tampa_(novel)	2013
http://dbpedia.org/resource/Brendan_I._Koerner	http://dbpedia.org/resource/The_Skies_Belong_to_Us	2013
http://dbpedia.org/resource/Charles_Montgomery_(writer)	http://dbpedia.org/resource/Happy_City	2013
http://dbpedia.org/resource/Lynn_Coady	http://dbpedia.org/resource/Heligoing	2013
http://dbpedia.org/resource/Sahar_Delijani	http://dbpedia.org/resource/Children_of_the_Jacaranda_Tree	2013
http://dbpedia.org/resource/Lena_Andersson_(author)	http://dbpedia.org/resource/Wi!ful_Disregard	2013
http://dbpedia.org/resource/Kate_DiCamillo	http://dbpedia.org/resource/Flora_&_Ulysses	2013
http://dbpedia.org/resource/Steve_Rushin	http://dbpedia.org/resource/The_34-Ton_Bat	2013
http://dbpedia.org/resource/Mookonda_Poonacha_Nitin_Kushalappa	http://dbpedia.org/resource/The_Early_Coorgs	2013
http://dbpedia.org/resource/Andrew_Rugasira	http://dbpedia.org/resource/A_good_african_story:_how_a_small_company_built_a_global_coffee_brand	2013
http://dbpedia.org/resource/Varun_Agarwal	http://dbpedia.org/resource/How_I_Braved_An_Aunt_and_Co-Founded_a_Million_Dollar_Company	2012
http://dbpedia.org/resource/Lakshmi_Raj_Sharma	http://dbpedia.org/resource/The_Tailor's_Needle	2012
http://dbpedia.org/resource/Tom_Wolfe	http://dbpedia.org/resource/Back_to_Blood	2012
http://dbpedia.org/resource/Saurabh_Dudeja	http://dbpedia.org/resource/Love_You_Forever_Only_In_That_Way	2012
http://dbpedia.org/resource/Jennifer_Lanthier	http://dbpedia.org/resource/The_Stamp_Collector	2012
http://dbpedia.org/resource/Guy_Gavriel_Kay	http://dbpedia.org/resource/The_Summer_Tree	2012
http://dbpedia.org/resource/Ashwin_Sanghi	http://dbpedia.org/resource/The_Krishna_Key	2012
http://dbpedia.org/resource/Paul_Kastenellos	http://dbpedia.org/resource/Antonina:_A_Byzantine_Slut	2012
http://dbpedia.org/resource/P._D._James	http://dbpedia.org/resource/Death_Comes_to_Pemberley	2011
http://dbpedia.org/resource/Miho_Mosulishvili	http://dbpedia.org/resource/Vazha-Pshavela_(biographical_novel)	2011
http://dbpedia.org/resource/Ruta_Sepetytė	http://dbpedia.org/resource/Between_Shades_of_Gray	2011
http://dbpedia.org/resource/Matt_James_(game_designer)	http://dbpedia.org/resource/Monster_Vault:_Threats_to_the_Nentir_Vale	2011
http://dbpedia.org/resource/Colson_Whitehead	http://dbpedia.org/resource/Zone_One	2011
http://dbpedia.org/resource/Paul_Kastenellos	http://dbpedia.org/resource/Count_No_Man_Happy:_A_Byzantine_Fantasy	2011
http://dbpedia.org/resource/Patrick_deWitt	http://dbpedia.org/resource/The_Sisters_Brothers	2011
http://dbpedia.org/resource/Dmitry_Glukhovsky	http://dbpedia.org/resource/Metro_2033_(novel)	2010
http://dbpedia.org/resource/Tom_McCarthy_(writer)	http://dbpedia.org/resource/C_(novel)	2010
http://dbpedia.org/resource/Jeannette_Walls	http://dbpedia.org/resource/Half_Broke_Horses	2010
http://dbpedia.org/resource/Jennifer_Egan	http://dbpedia.org/resource/A_Visit_from_the_Goon_Squad	2010

SPARQL - Variable Assignments

- Example: Select all authors with their notable works and year of publication

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX dbp: <http://dbpedia.org/property/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
```

new variable assignment
with string manipulation
and regular expression

```
SELECT ?author ?work SUBSTR(REPLACE(STR(?date), "[^0-9]", ""), 1, 4) AS ?year
FROM <http://dbpedia.org/>
WHERE {
    ?author rdf:type dbo:Writer .
    ?author dbo:notableWork ?work .
    ?work dbp:releaseDate ?date
    FILTER REGEX (?date, "[0-9]{4}") .
} ORDER BY DESC(?year)
LIMIT 100
```

author	work	year
http://dbpedia.org/resource/Henry_James	http://dbpedia.org/resource/The_Ambassadors	6190
http://dbpedia.org/resource/Henry_James	http://dbpedia.org/resource/The_Wings_of_the_Dove	3019
http://dbpedia.org/resource/Henry_James	http://dbpedia.org/resource/The_Ambassadors	2419
http://dbpedia.org/resource/Henry_James	http://dbpedia.org/resource/The_Wings_of_the_Dove	2119
http://dbpedia.org/resource/Sergio_Troncoso	http://dbpedia.org/resource/The_Nature_of_Truth	2014
http://dbpedia.org/resource/R._Barri_Flowers	http://dbpedia.org/resource/Masters_of_True_Crime	2012
http://dbpedia.org/resource/Steve_Lillebuen	http://dbpedia.org/resource/The_Devil's_Cinema	2012
http://dbpedia.org/resource/Emily_M._Danforth	http://dbpedia.org/resource/The_Miseducation_of_Cameron_Post	2012
http://dbpedia.org/resource/Dave_Eggers	http://dbpedia.org/resource/A_Hologram_for_the_King	2012
http://dbpedia.org/resource/Sergio_Troncoso	http://dbpedia.org/resource/From_This_Wicked_Patch_of_Dust	2011
http://dbpedia.org/resource/Shimun_Vrochek	http://dbpedia.org/resource/Piter_(novel)	2010
http://dbpedia.org/resource/Jonathan_Maberry	http://dbpedia.org/resource/Rot_&_Ruin	2010
http://dbpedia.org/resource/Surender_Mohan_Pathak	http://dbpedia.org/resource/Daylight_Robbery_(novel)	2010
http://dbpedia.org/resource/Amish_Tripathi	http://dbpedia.org/resource/The_Immortals_of_Meluha	2010
http://dbpedia.org/resource/Gloria_Feldt	http://dbpedia.org/resource/No_Excuses_(book)	2010
http://dbpedia.org/resource/G._B._Singh	http://dbpedia.org/resource/Gandhi_Under_Cross_Examination	2009
http://dbpedia.org/resource/David_Berman_(graphic_designer)	http://dbpedia.org/resource/Do_Good_Design	2009
http://dbpedia.org/resource/Abraham_Vergheze	http://dbpedia.org/resource/Cutting_for_Stone	2009
http://dbpedia.org/resource/Joan_London_(Australian_author)	http://dbpedia.org/resource/The_Good_Parents	2008
http://dbpedia.org/resource/Jon_Smith	http://dbpedia.org/resource/Get_into_Bed_with_Google	2008
http://dbpedia.org/resource/Carole_Wilkinson	http://dbpedia.org/resource/Dragon_Moon	2007
http://dbpedia.org/resource/William_P._Young	http://dbpedia.org/resource/The_Shack	2007
http://dbpedia.org/resource/Tucker_Max	http://dbpedia.org/resource/I_Hope_They_Serve_Beer_in_Hell	2006
http://dbpedia.org/resource/Ben_Cormack	http://dbpedia.org/resource/The_Story_of_Egmo	2006
http://dbpedia.org/resource/David_Mitchell_(author)	http://dbpedia.org/resource/Black_Swan_Green	2006
http://dbpedia.org/resource/Brian_Keene	http://dbpedia.org/resource/The_Conqueror_Worms	2006
http://dbpedia.org/resource/John_Jantsch	http://dbpedia.org/resource/The_Commitment_Engine	2006
http://dbpedia.org/resource/Cecelia_Ahern	http://dbpedia.org/resource/If_You_Could_See_Me_Now_(Cecelia_Ahern_novel)	2005
http://dbpedia.org/resource/Carole_Wilkinson	http://dbpedia.org/resource/Garden_of_the_Purple_Dragon	2005
http://dbpedia.org/resource/Ariel_Levy	http://dbpedia.org/resource/Female_Chauvinist_Pigs	2005
http://dbpedia.org/resource/Daniel_Kehlmann	http://dbpedia.org/resource/Measuring_the_World	2005
http://dbpedia.org/resource/David_Wellington_(author)	http://dbpedia.org/resource/Monster_Island_(Wellington_novel)	2004
http://dbpedia.org/resource/Jon_Smith	http://dbpedia.org/resource/The_Bloke's_Guide_To_Pregnancy	2004
http://dbpedia.org/resource/Cecelia_Ahern	http://dbpedia.org/resource/PS,_I_Love_You_(novel)	2004
http://dbpedia.org/resource/G._B._Singh	http://dbpedia.org/resource/Gandhi_Behind_the_Mask_of_Divinity	2004
http://dbpedia.org/resource/Geoff_Ryman	http://dbpedia.org/resource/Air_(novel)	2004
http://dbpedia.org/resource/Ted_Dekker	http://dbpedia.org/resource/Three_(novel)	2003
http://dbpedia.org/resource/Brian_Keene	http://dbpedia.org/resource/The_Rising_(Keene_novel)	2003
http://dbpedia.org/resource/Stephan_Collishaw	http://dbpedia.org/resource/The_Last_Girl	2003
http://dbpedia.org/resource/David_Levithan	http://dbpedia.org/resource/Boy_Meets_Boy_(novel)	2003
http://dbpedia.org/resource/Dan_Brown	http://dbpedia.org/resource/The_Da_Vinci_Code	2003
http://dbpedia.org/resource/Jhumpa_Lahiri	http://dbpedia.org/resource/The_Namesake	2003
http://dbpedia.org/resource/Frans_Sammut	http://dbpedia.org/resource/The_Da_Vinci_Code	2003
http://dbpedia.org/resource/Margaret_Atwood	http://dbpedia.org/resource/Oryx_and_Crake	2003
http://dbpedia.org/resource/Sharon_Carter_Rogers	http://dbpedia.org/resource/Drift_(novel)	2002
http://dbpedia.org/resource/Laurie_Ralse_Anderson	http://dbpedia.org/resource/Catalyst_(novel)	2002
http://dbpedia.org/resource/Avi_(author)	http://dbpedia.org/resource/Crispin:_The_Cross_of_Lead	2002
http://dbpedia.org/resource/Julian_Stockwin	http://dbpedia.org/resource/Kydd_(novel)	2001
http://dbpedia.org/resource/Andreas_Eschbach	http://dbpedia.org/resource/Fine_Billion_Dollar	2001

SPARQL - Aggregate Functions

- Example: How many authors are there in DBpedia?

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dbo: <http://dbpedia.org/ontology/>

SELECT COUNT(?author) AS ?num
FROM <http://dbpedia.org/>
WHERE {
    ?author rdf:type dbo:Writer .
}
```

aggregate
function

SPARQL - Aggregate Functions

- Example: How many distinct authors are there in DBpedia who have entries for notable works?

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dbo: <http://dbpedia.org/ontology/>

SELECT COUNT(DISTINCT(?author)) AS ?num
FROM <http://dbpedia.org/>
WHERE {
    ?author rdf:type dbo:Writer ;
           dbo:notableWork ?work .
}
```

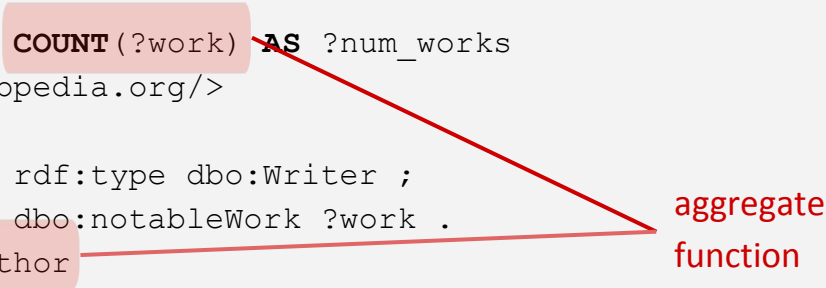
aggregate
function

SPARQL - Aggregate Functions

- Example: Which author wrote how many notable works?

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dbo: <http://dbpedia.org/ontology/>

SELECT ?author COUNT(?work) AS ?num_works
FROM <http://dbpedia.org/>
WHERE {
    ?author rdf:type dbo:Writer ;
           dbo:notableWork ?work .
} GROUP BY ?author
ORDER BY DESC (?num_works)
```



aggregate
function

author	num_works
http://dbpedia.org/resource/Julian_Stockwin	16
http://dbpedia.org/resource/Vince_Powell	14
http://dbpedia.org/resource/Roald_Dahl	13
http://dbpedia.org/resource/Roy_Clarke	13
http://dbpedia.org/resource/Rexhep_Qosja	13
http://dbpedia.org/resource/Edward_Stratemeyer	12
http://dbpedia.org/resource/John_Banville	12
http://dbpedia.org/resource/Alan_Moore	11
http://dbpedia.org/resource/Chris_Meledandri	11
http://dbpedia.org/resource/Edna_O'Brien	11
http://dbpedia.org/resource/David_Mamet	11
http://dbpedia.org/resource/Brian_Cooke	11
http://dbpedia.org/resource/John_David_Morley	10
http://dbpedia.org/resource/Fyodor_Dostoyevsky	10
http://dbpedia.org/resource/Joseph_Conrad	10
http://dbpedia.org/resource/William_Trevor	9
http://dbpedia.org/resource/Samuel_Beckett	9
http://dbpedia.org/resource/Maurice_Gran	9
http://dbpedia.org/resource/Mark_Evanier	9
http://dbpedia.org/resource/Eric_Chappell	9
http://dbpedia.org/resource/Johnnie_Mortimer	9
http://dbpedia.org/resource/Charles_Dickens	9
http://dbpedia.org/resource/Laurence_Marks_(British_writer)	9
http://dbpedia.org/resource/Cicero	9
http://dbpedia.org/resource/Homer_Hickam	9
http://dbpedia.org/resource/Writings_of_Marcus_Tullius_Cicero	9
http://dbpedia.org/resource/Ismail_Kadare	9

SPARQL - Aggregate Functions

- Example: Which author wrote exactly 3 notable works (according to DBpedia)?

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dbo: <http://dbpedia.org/ontology/>

SELECT ?author COUNT(?work) AS ?num_works
FROM <http://dbpedia.org/>
WHERE {
    ?author rdf:type dbo:Writer ;
           dbo:notableWork ?work .
} GROUP BY ?author
HAVING COUNT(?work) = 3
ORDER BY ?author
```

aggregate
function

author	num_works
http://dbpedia.org/resource/Abdullah_Hussain	3
http://dbpedia.org/resource/Abraham_Verghese	3
http://dbpedia.org/resource/Adalbert_Stifter	3
http://dbpedia.org/resource/Adam_Hamdy	3
http://dbpedia.org/resource/Adam_Roberts_(British_writer)	3
http://dbpedia.org/resource/Ahmad_Akbarpour	3
http://dbpedia.org/resource/Alan_Plater	3
http://dbpedia.org/resource/Algis_Budrys	3
http://dbpedia.org/resource/Alice_Sebold	3
http://dbpedia.org/resource/Alison_Bechdel	3
http://dbpedia.org/resource/Alistair_MacLeod	3
http://dbpedia.org/resource/Amish_Tripathi	3
http://dbpedia.org/resource/Amitav_Ghosh	3
http://dbpedia.org/resource/Amy_Hennig	3
http://dbpedia.org/resource/Amy_Holden_Jones	3
http://dbpedia.org/resource/Andrej_Blatnik	3
http://dbpedia.org/resource/Andrew_Marshall_(screenwriter)	3
http://dbpedia.org/resource/Ann-Marie_MacDonald	3
http://dbpedia.org/resource/Ann_C._Crispin	3
http://dbpedia.org/resource/Anne_Fine	3
http://dbpedia.org/resource/Anne_McCaffrey	3
http://dbpedia.org/resource/Anthony_Bell_(director)	3
http://dbpedia.org/resource/Antonio_Ungar	3
http://dbpedia.org/resource/Arnold_Lobel	3
http://dbpedia.org/resource/Aron_Eli_Coleite	3
http://dbpedia.org/resource/Arthur_Hailey	3

SPARQL - Aggregate Functions

- SPARQL 1.1 provides more aggregate functions
 - SUM
 - AVG
 - MIN
 - MAX
 - SAMPLE -- „pick“ one non-deterministically
 - GROUP_CONCAT -- concatenate values with a designated string separator

SPARQL - Aggregate Functions

- Example: Compare an arbitrary title and non-english titles of notable Works by authors

```

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dbo: <http://dbpedia.org/ontology/>

SELECT (SAMPLE(?title) AS ?name)
        (GROUP_CONCAT(?alt_titles; SEPARATOR=", " ) AS ?alt_names)
FROM <http://dbpedia.org/>
WHERE {
    ?author rdf:type dbo:Writer .
    ?author dbo:notableWork ?work .
    ?work rdfs:label ?title .
    ?work rdfs:label ?alt_titles
    FILTER (LANG(?alt_titles)!="en") .
} GROUP BY ?author
  
```

aggregate
function

[illegible]

SPARQL



08 - SPARQL Subqueries and Property Paths

OpenHPI - Course Knowledge Engineering with Semantic Web Technologies

Lecture 2: RDF Based Knowledge Representation