

The Tangled Web

Past, Present, Future

Suzan Uskudarli - SosLab, Cmpe, BOUN
suzan.uskudarli@boun.edu.tr

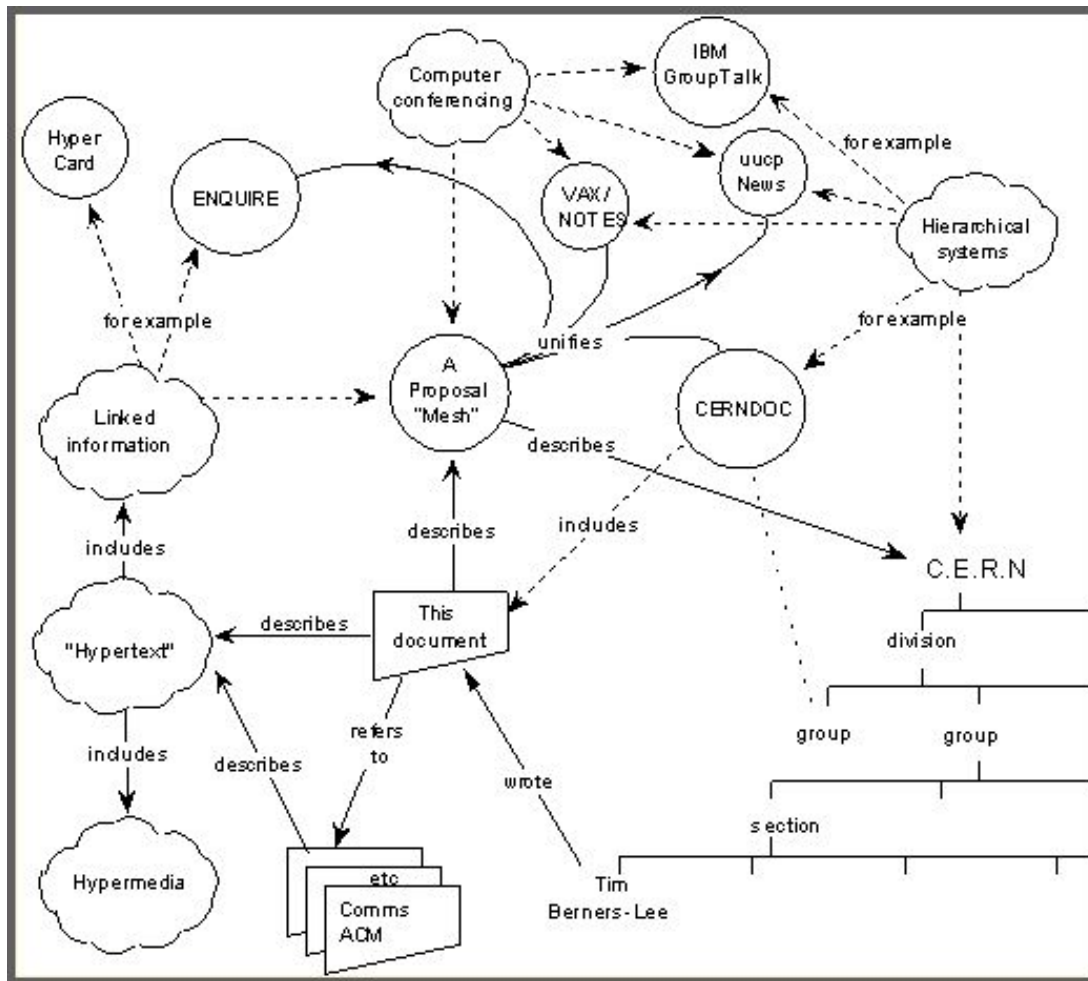
The Proposal

By Tim Berners-Lee (TBL)
1998/1999

Main goal:

Support **diversity**

- Documents
- People



Inception -- CERN

- Thousands of creative employees
- Hierarchical organization
 - does not fit how people work
 - people are multiply connected in a complex web of people and artifacts
- Heterogeneous information systems

Issues:

- Loss of information
- Difficulty in sharing information

Vision

- Information access to all!
- Web for All -- global community
- Distributed

Standards by  (World Wide Web Consortium)

- Participatory
- Open

HTML / HTTP -- The 1st CERN page



World Wide Web

The WorldWideWeb (W3) is a wide-area [hypermedia](#) information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an [executive summary](#) of the project, [Mailing lists](#) , [Policy](#) , November's [W3 news](#) , [Frequently Asked Questions](#) .

[What's out there?](#)

Pointers to the world's online information, [subjects](#) , [W3 servers](#), etc.

[Help](#)

on the browser you are using

[Software Products](#)

A list of W3 project components and their current state. (e.g. [Line Mode](#) ,X11 [Viola](#) , [NeXTStep](#) , [Servers](#) , [Tools](#) , [Mail robot](#) , [Library](#))

[Technical](#)

Details of protocols, formats, program internals etc

[Bibliography](#)

Paper documentation on W3 and references.

[People](#)

A list of some people involved in the project.

[History](#)


A summary of the history of the project.

[How can I help ?](#)

If you would like to support the web..

[Getting code](#)

Getting the code by [anonymous FTP](#) , etc.



Connected documents

Current Web



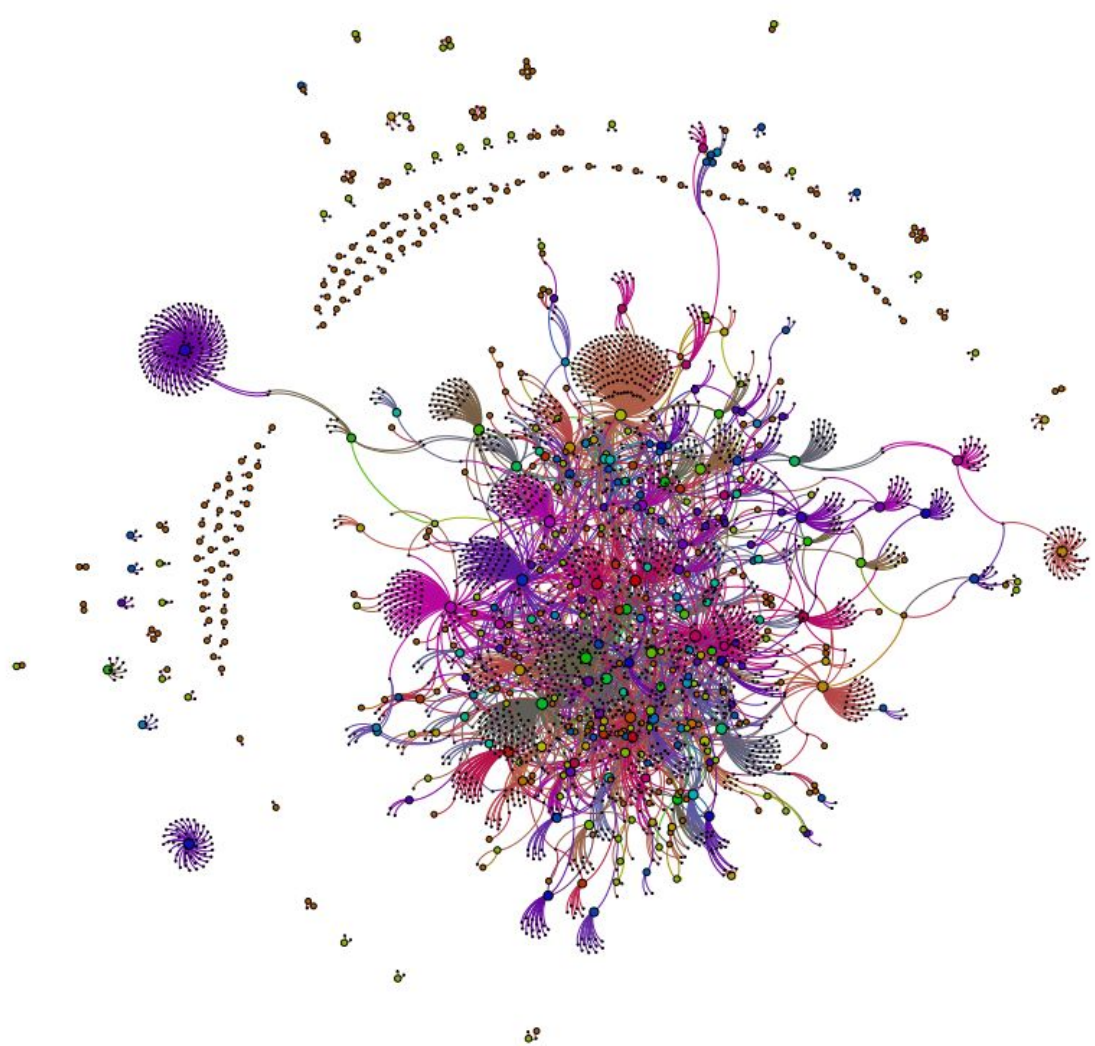
- User generated contributions
 - Social Media - Twitter, Facebook, Youtube, ...
 - Wikipedia, ...
 - Ecommerce services: Amazon, Alibaba, ...
- Fake news
- Bubbles
- More centralized
- Loss of diversity

Connected people

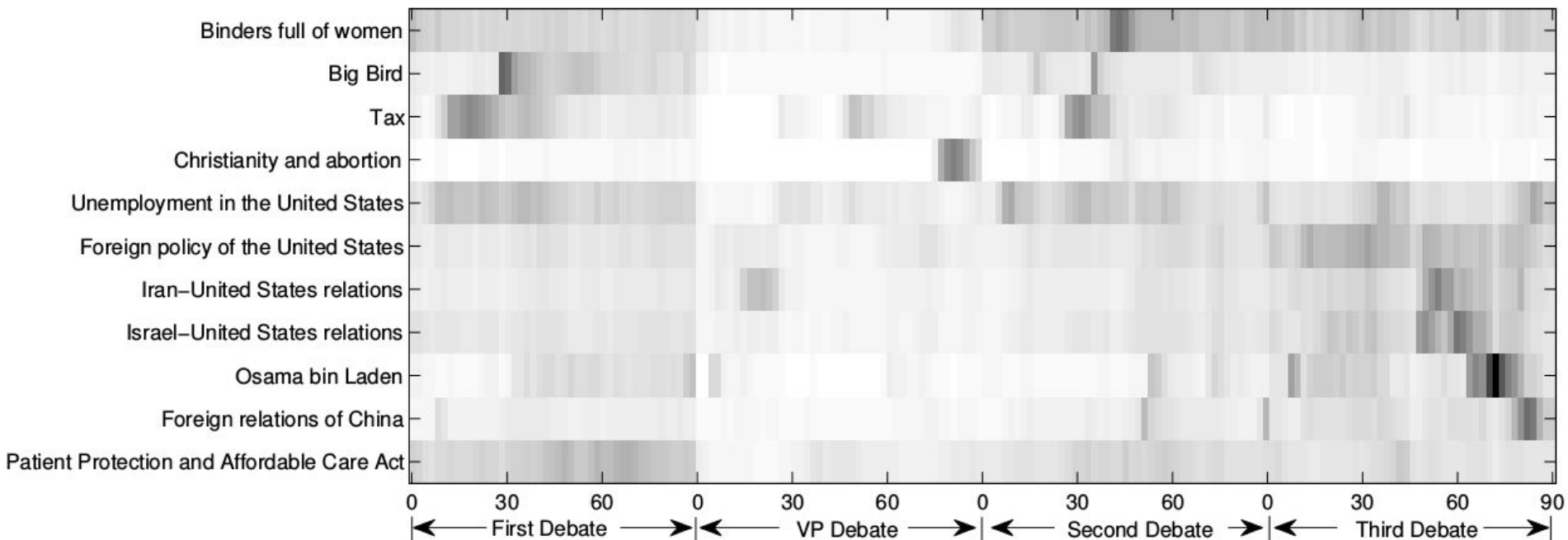
SNA - Gezi

5000 user

Mention graph



Issues during 4 US Presidential debates



Moving into the Web of Data

- Make all kinds of data available
- Knowledge representation
- Semantic processing
 - Solve problems
 - Create better services

Next Web: Linked Data

Data represented as triples:

subject predicate object

dbr:Naked_mole-rat **foaf:depiction**
<<http://commons.wikimedia.org/wiki/Special:FilePath/Nacktmull.jpg>>

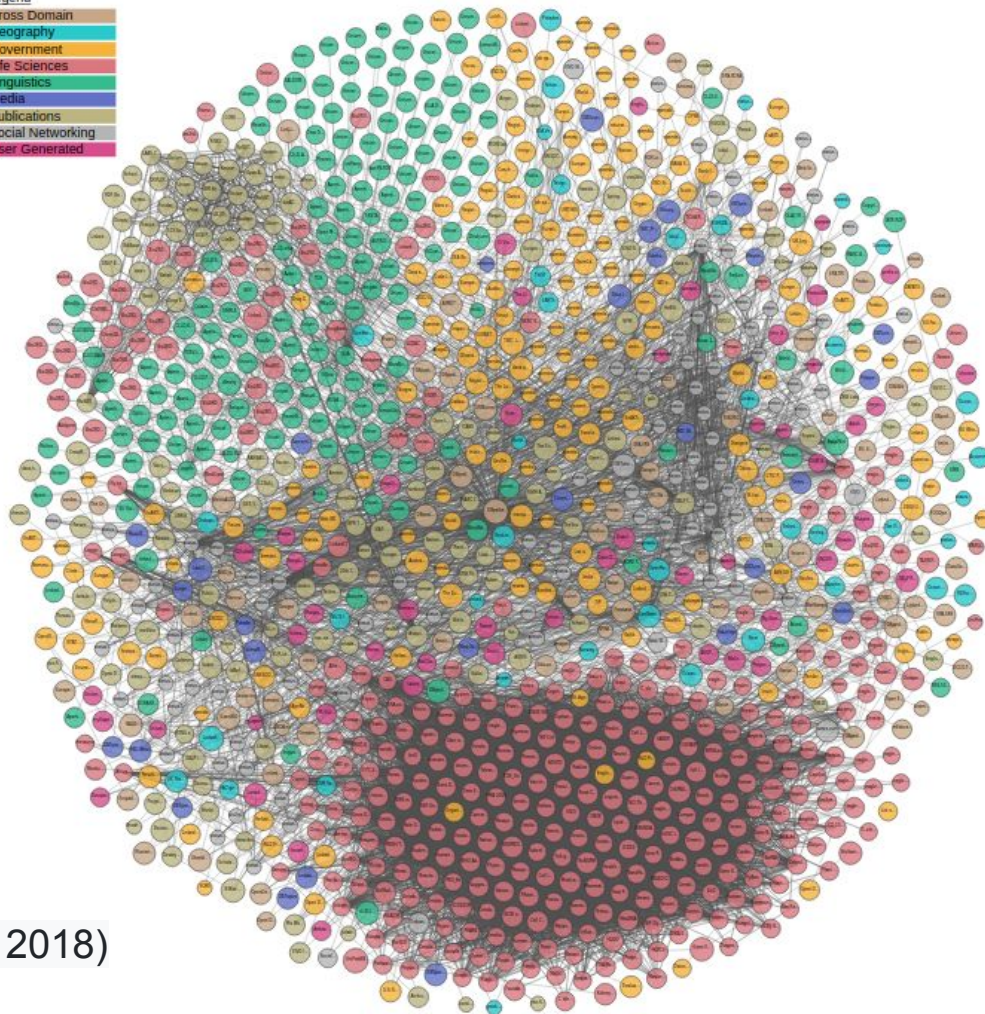


Lost of info about the Naked Mole Rat

```
dbr:Naked_mole-rat ns25:hypernym dbr:Blesmol ;  
dbp:taxon "Heterocephalus glaber"^^rdf:langString ;  
dbp:binomial "Heterocephalus glaber"^^rdf:langString ;  
dbp:binomialAuthority "R\u00FCppell, 1842"^^rdf:langString ;  
dbp:statusSystem "iucn3.1"^^rdf:langString .
```

Linked Open Data

Legend



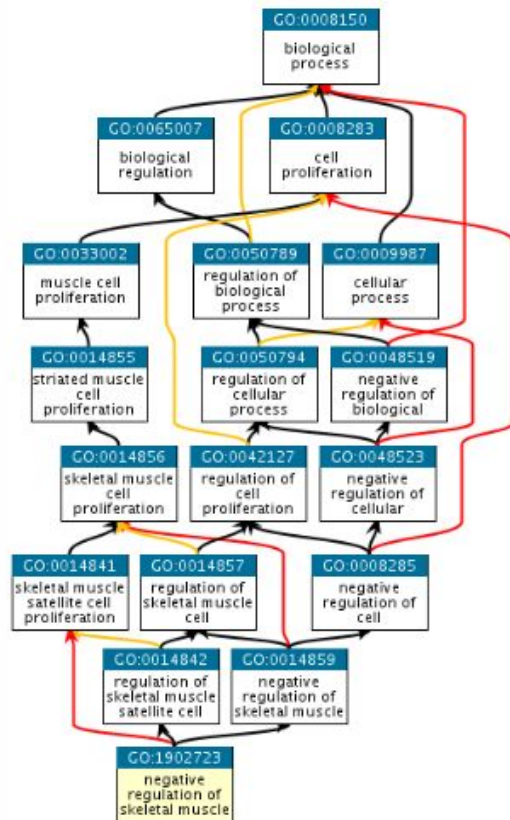
1,184 datasets with 15,993 links (as of April 2018)

Src: <https://lod-cloud.net>

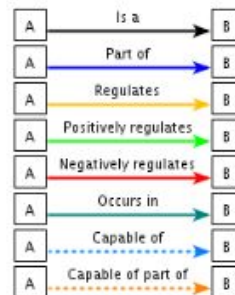
Life Sciences - Genetic Information

Ancestor chart for GO:1902723

Chart options



QuickGO - <https://www.ebi.ac.uk/QuickGO>



```

...
{
  "id": "GO:1902723",
  "isObsolete": false,
  "name": "negative ...",
  "definition": {
    "text": "Any process...",
    "xrefs": [
      {"dbCode": "GO_REF",
       "dbId": "0000058"},
      {"dbCode": "PMID",
       "dbId": "23212449"}]
  },
  "synonyms": [
    {"name": "inhibition of
     satellite cell proliferation",
     "type": "narrow"},
    {"name":
     "down-regulation of satellite
     cell proliferation",
     "type": "exact"}
  ]
}
....

```

Linked Data

Global network of **things**:

- each thing is identified by a **URI**
- things connected by typed links (**relations**)
- fetching a URI gives a set of **statements**
- open access

Connected data



Examples...

— Representing knowledge & data —

Open Context, used LOD, Bones in Turkey

View of Bone Ref# 1161 - Google Chrome

Secure | <https://opencontext.org/subjects/TESTSPA0000005375>

OPEN CONTEXT About Explore Data Record Contact Donate Search

Context: Turkey / Pınarbaşı / Site B / Stratum 5 / Stratum 6 / Context BBH / Bone Ref# 1161 (Animal Bone)

Main Observation Standards Annotations

↓ Descriptions (17)


Descriptive Variable	Value(s)
Taxon	Ovis sp.
Element	Metatarsal
Side	Left
Distal Fusion	distal fused
Sex	Male
Fusion stages	Over 1.5-2.25 yrs
Age group	7
Reference	1161
Species Comment	Ovis
Part	Neonatal because born with III & IV fused
Volume	260.0
Size	2-5 cm
Species	Unknown
Retrieval Method	Dry Sieve
Age Data	Fused

Suggested Citation

Denise Carruthers. "Bone Ref# 1161 from Turkey / Pınarbaşı / Site B / Stratum 5 / Stratum 6 / Context BBH". (2013) In *Pınarbaşı 1994: Animal Bones*. Denise Carruthers (Ed.). Released: 2013-03-04. Open Context.
<<http://opencontext.org/subjects/TESTSPA0000005375>> ARK (Archive): <https://n2t.net/ark://28722/k2251fn7m>

Editorial Status ●●●○ Part of Project
Managing editor reviewed Pınarbaşı 1994: Animal Bones

Mapping Data



512px-Sema....png Show all

Topic Identification in Twitter

- We created the Ontology: Topic
- Used entity linking to identify meaningful units
- Related entities to form a graph to determine topics
- Identified topics from tweets during events, mostly 2012 and 2016 US Elections (> 1 million)

Semantic Topic

Persons

(724)Tim Kaine

Locations

Temporal Expressions

Other type of elements

(54)Abortion-rights movements

(150)Abortion

Persons

(1344)Donald Trump

(1328)Hillary Clinton

Locations

Temporal Expressions

(148)Tonight

(138)Now

Other type of elements

(174)Debate

Persons

(1158)Donald Trump

Locations

Temporal Expressions

(936)year:2016

Other type of elements

(33)Constitutionality

(115)Terry stop

Semantic Queries

PREFIX **dcterms**: <<http://purl.org/dc/terms/>>

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

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

PREFIX **topico**: <<http://soslab.cmpe.boun.edu.tr/ontologies/topico.owl#>>

PREFIX **dbr**: <<http://dbpedia.org/resource/>>

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

PREFIX **time**: <<http://www.w3.org/2006/time#>>

PREFIX **dbc**: <<http://dbpedia.org/resource/Category:>>

PREFIX **dul**: <<http://www.ontologydesignpatterns.org/ont/dul/DUL.owl#>>

PREFIX **xsd**: <<http://www.w3.org/2001/XMLSchema#>>

PREFIX **xs**: <<http://www.w3.org/2001/XMLSchema#>>

PREFIX **ti**: <<http://www.ontologydesignpatterns.org/cp/owl/timeinterval.owl#>>

PREFIX **dbpedia-owl**: <<http://dbpedia.org/ontology/>>

PREFIX **wikidata-dbpedia**: <<http://wikidata.dbpedia.org/resource/>>

PREFIX **owl**: <<http://www.w3.org/2002/07/owl#>>

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

PREFIX **foaf**: <<http://xmlns.com/foaf/0.1/>>

Common Topics about Obama in 2012/2016

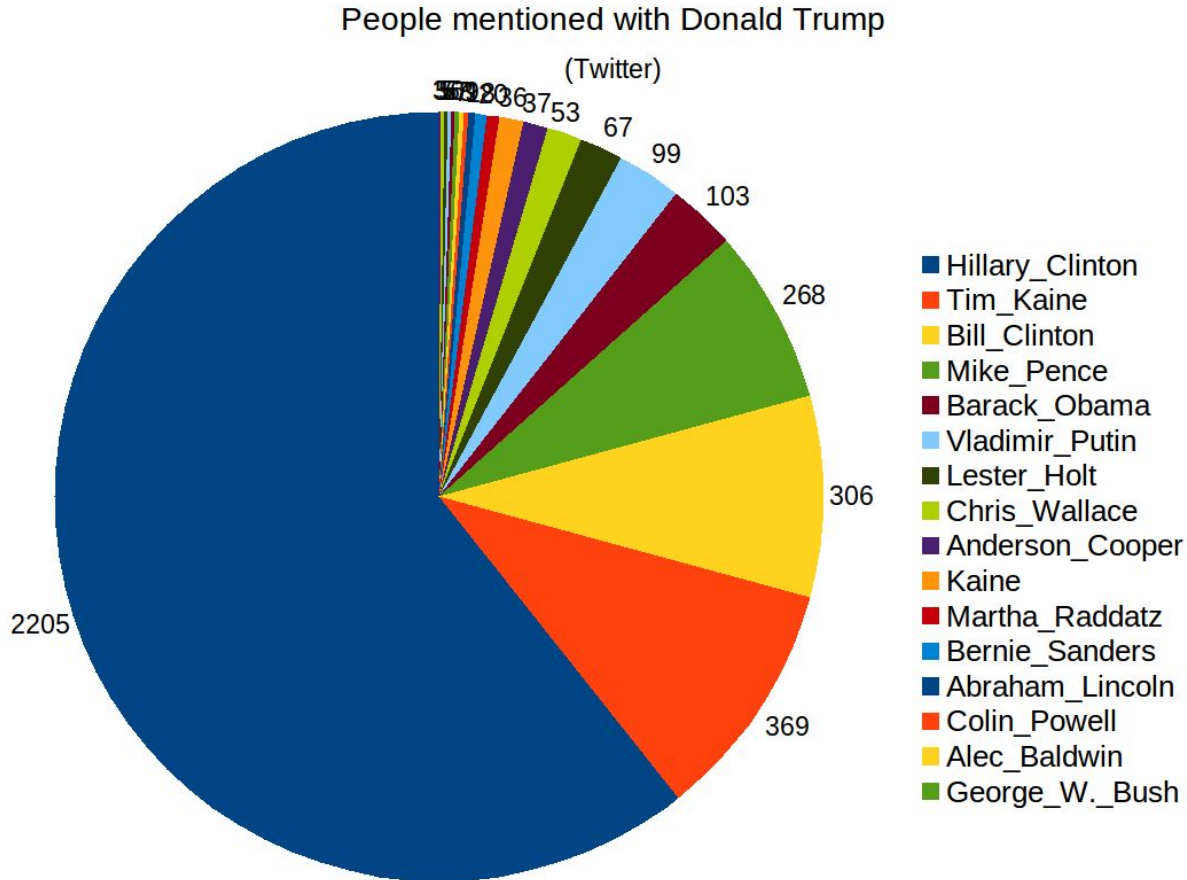
```
SELECT ?about1 {
SERVICE <http://193.140.196.97:3031/topic/sparql>
{
  SELECT DISTINCT ?about1 WHERE {
    ?topic1 topico:isAbout ?about1 .
    ?topic1 topico:hasPerson dbr:Barack_Obama}
}
SERVICE <http://193.140.196.97:3032/topic/sparql>
{
  SELECT DISTINCT ?about2 WHERE {
    ?topic1 topico:isAbout ?about2 .
    ?topic1 topico:hasPerson dbr:Barack_Obama}}
FILTER( ?about1=?about2)
}
```

Common issues w/r Obama in 2012 & 2016

dbr:Tax_cut
dbr:Golf
dbr:Economy
dbr:Black_people
dbr:Racism
dbr:Violence
dbr:Birth_certificate
dbr:Lie
dbr:Muslim

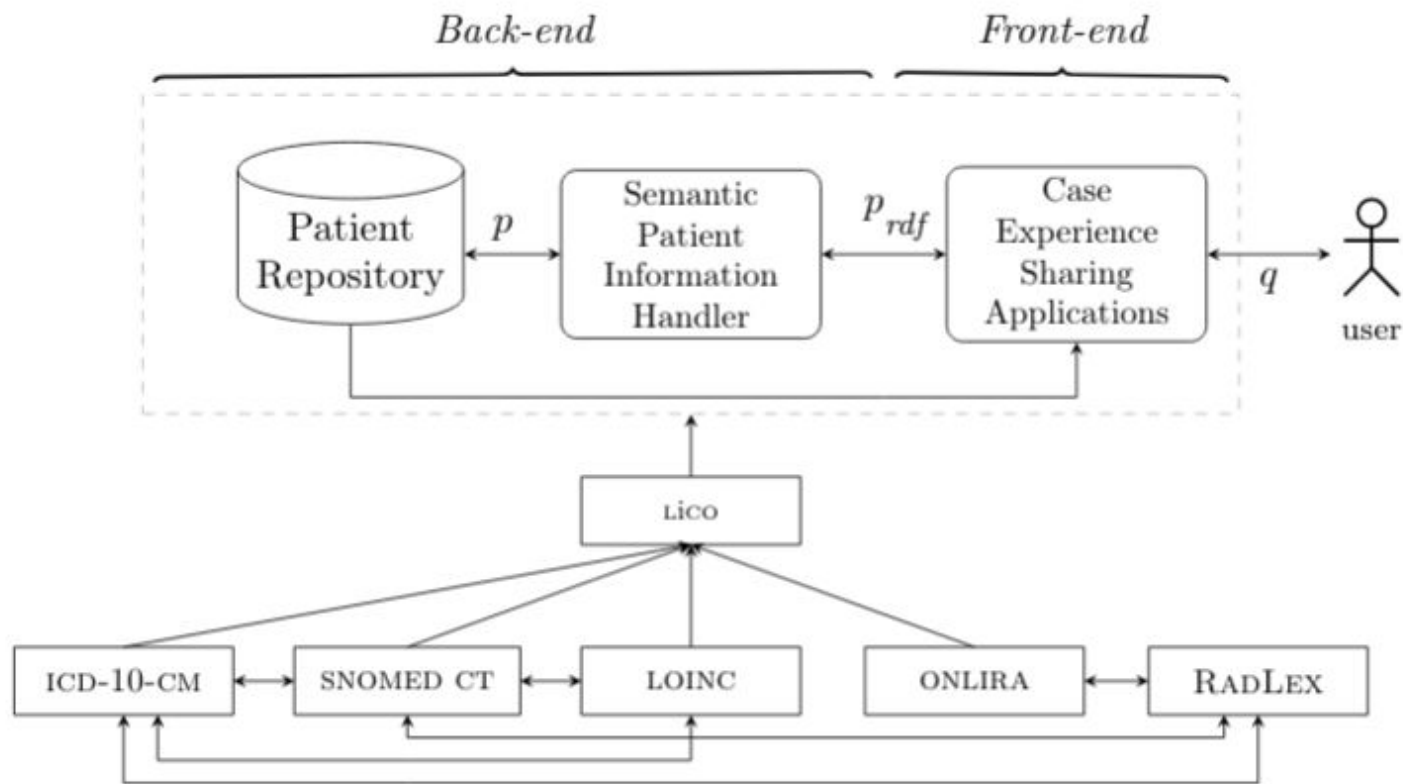
dbr:Barack_Obama_presidential_campaign,_
2008
dbr:Russia
dbr:Iraq
dbr:Immigration
dbr:Blame
dbr:Central_Intelligence_Agency

People mentioned with Donald Trump

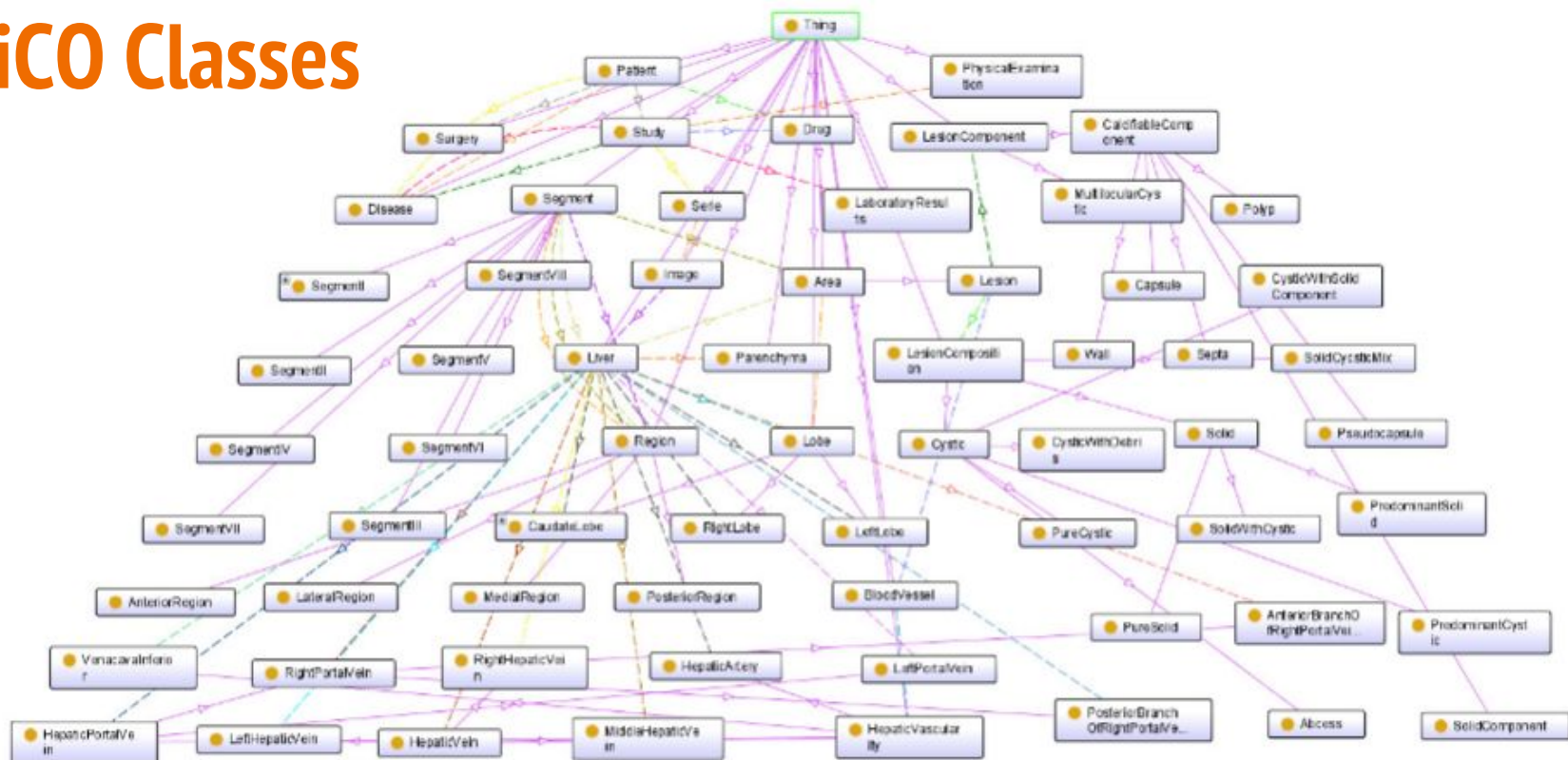


Health:

Liver
Case
Ontology
(LiCO)



LiCO Classes



Semantic Query: The diagnosis of patients who have lesions near a blood vessel

```
select ?patient ?lesion ?vessel ?finalDiagnosis
where {
  ?patient l:hasStudy ?study.
  ?study   l:hasFinalDiagnosis ?finalDiagnosis;
          l:hasSerie ?serie.
  ?serie   l:hasImage ?img.
  ?img     l:hasLiver ?liver.
  ?liver   o:hasArea ?lesion.
  ?lesion  l:isCloseToBloodVessel ?bv.
  ?bv     l:hasBloodVesselName ?vessel }
```

American ICD-10-CM (diagnosis)

patient	lesion	vessel	finalDiagnosis	
l:Capa-00342	o:Lesion213	o:Liver849VenacavaInferior	icdten:Q50.5	
l:Capa-00342	o:Lesion213	o:Liver849RightPortalVein	icdten:Q50.5	
l:Capa-00342	o:Lesion212	o:Liver849VenacavaInferior	icdten:Q50.5	
l:Capa-00342	o:Lesion212	o:Liver849RightPortalVein	icdten:Q50.5	
l:Capa-00050	o:Lesion122	o:Liver589HepaticVein	icdten:K75.9	Inflammatory liver disease
l:Capa-00050	o:Lesion122	o:Liver589HepaticVein	icdten:C22.0	
l:Capa-00024	o:Lesion115	o:Liver576RightHepaticVein	icdten:Q50.5	
l:Capa-00024	o:Lesion115	o:Liver576MiddleHepaticVein	icdten:Q50.5	
l:Capa-00024	o:Lesion115	o:Liver576RightPortalVein	icdten:Q50.5	
l:Capa-00241	o:Lesion178	o:Liver748RightPortalVein	icdten:Q50.5	
l:Capa-00230	o:Lesion174	o:Liver738PosteriorBranchOfRightPortalVein	icdten:C22.0	Liver cell carcinoma

Current opportunities

- Standard/Shared knowledge representation
 - Shared data
 - Wider representation
 - Interdisciplinary
- Processability
 - Searching
 - Reasoning
- Global Learning/Research Community

Next Generation Web

Connecting the minds... and machines (IoT)

- Open
- Linked
- Intelligent web

We have stepped into it already

Complexity lives on...

Adjective

- S: (adj) **done**, through, through with (having finished or arrived at completion) *"certain to make history before he's done"*; *"it's a done deed"*; *"after the treatment, the patient is through except for follow-up"*; *"almost through with his studies"*
- S: (adj) **done** (cooked until ready to serve)

Contact:

SosLab, CmpE, Boğaziçi University

<http://soslab.cmpe.boun.edu.tr/>

<http://www.cmpe.boun.edu.tr/~uskudarli>

suzan.uskudarli@boun.edu.tr

SoSLab



Complex Systems
Research Lab



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