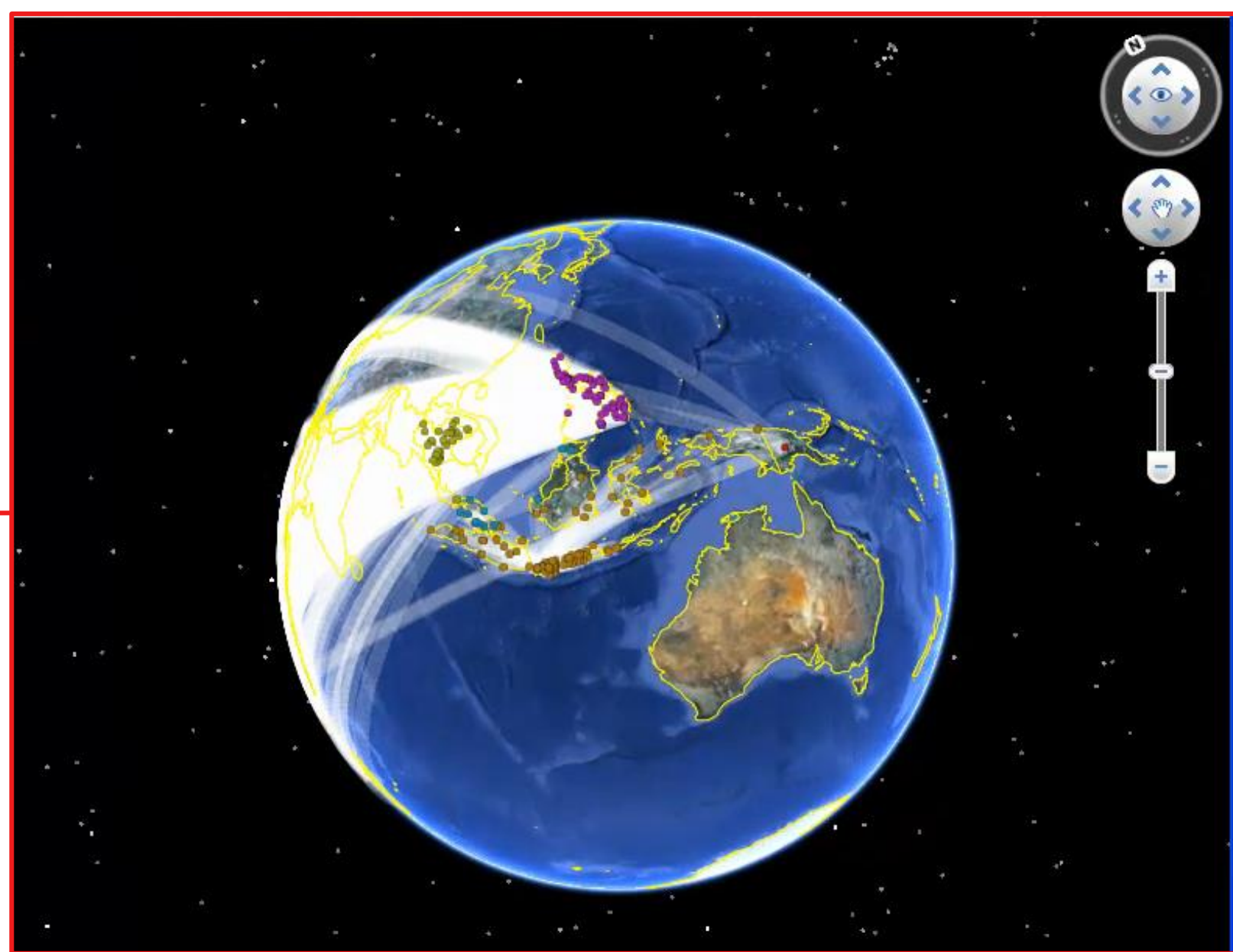


# LINKING DATA AND PEOPLE ON A SEMANTIC WEB



Fabien GANDON, @fabien\_gandon <http://fabien.info>

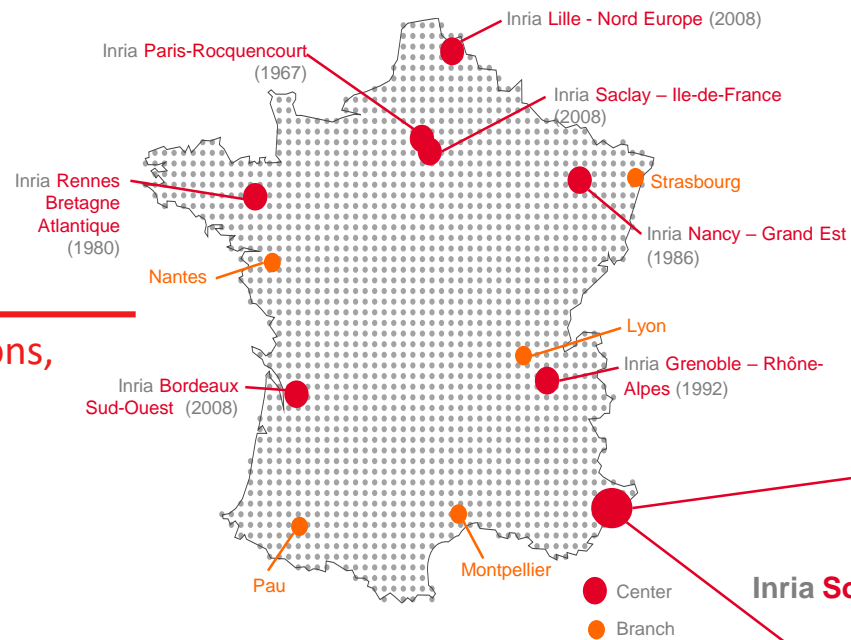


# WIMMICS TEAM

Web-Instrumented Man-Machine Interactions,  
Communities and Semantics

- Inria
- CNRS
- UCA, Univ. Nice

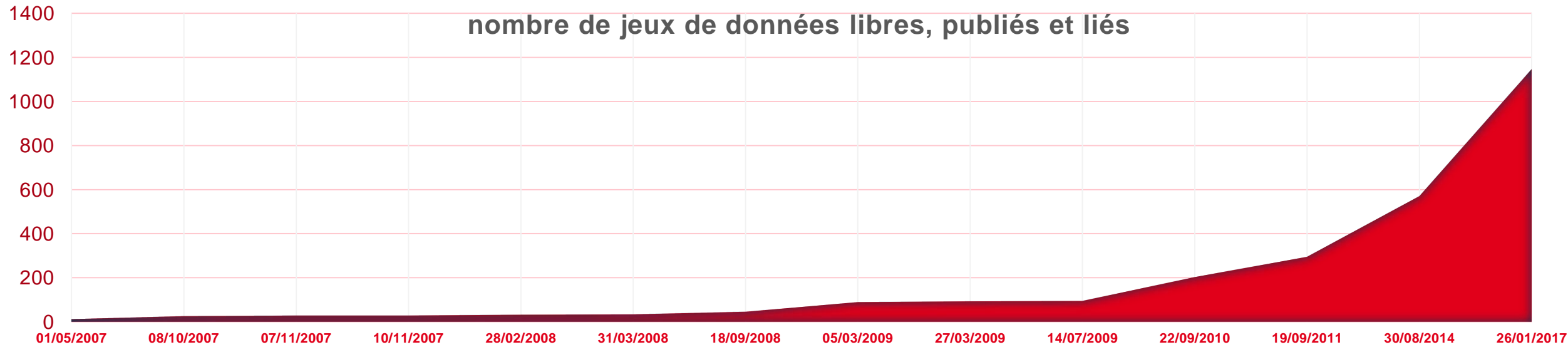
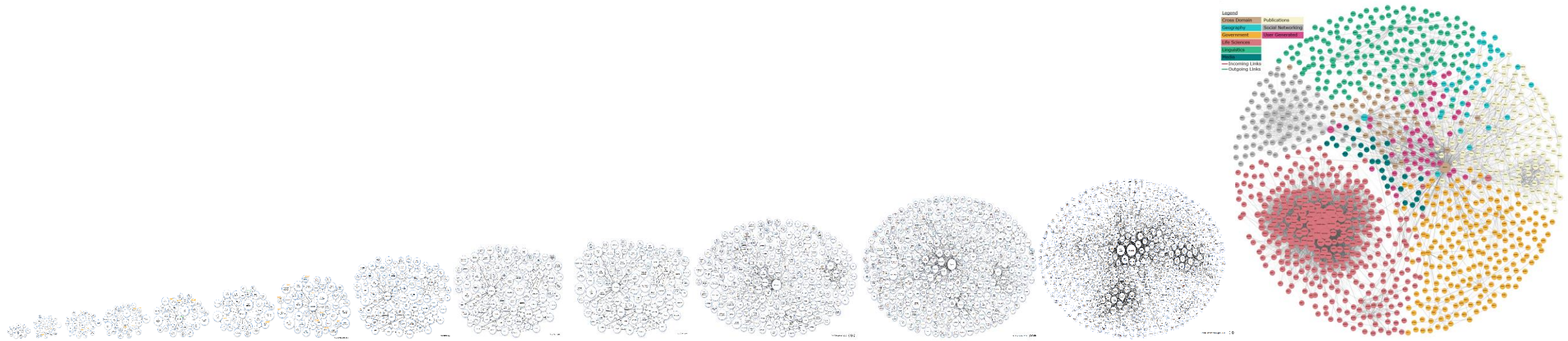
} I3S



Inria **Sophia Antipolis Méditerranée** (1983)

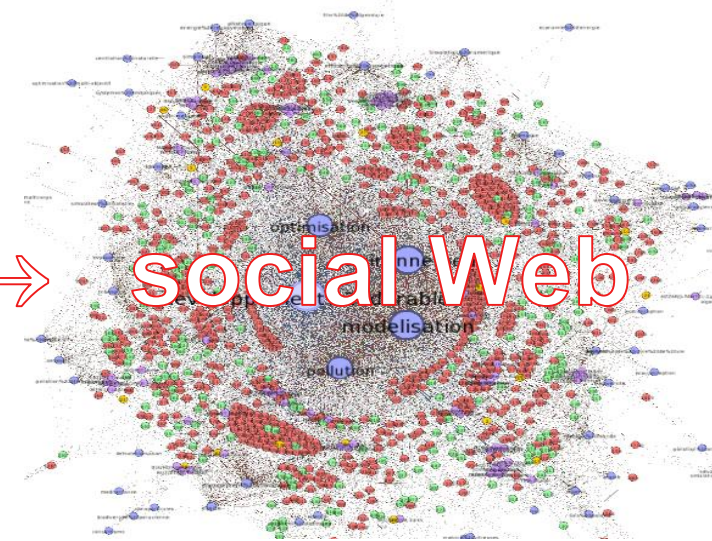
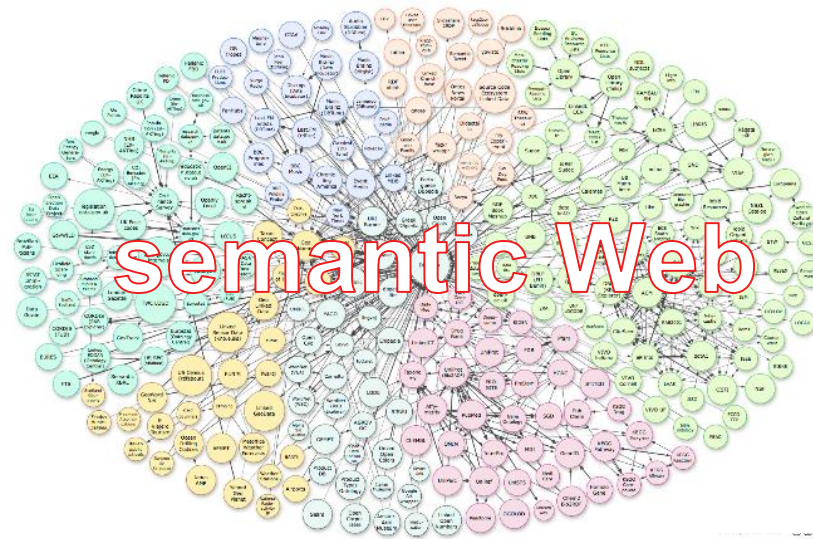


# linked open data(sets) on the Web



# CHALLENGE

to bridge social semantics and formal semantics on the Web



## MULTI-DISCIPLINARY TEAM

- 41 members 2016, 50 in 2015
- 14 nationalities
- 1 DR, 3 Professors
- 3CR, 4 Assistant professors
- 1 SRP

### **DR/Professors:**

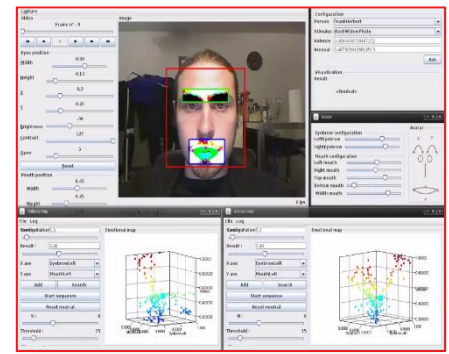
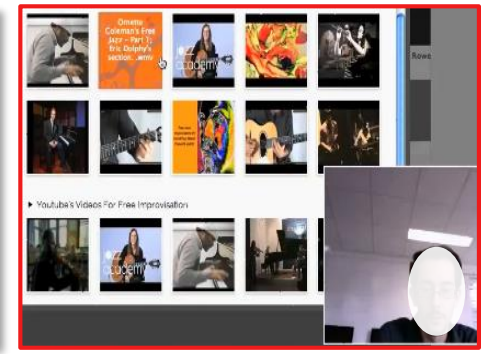
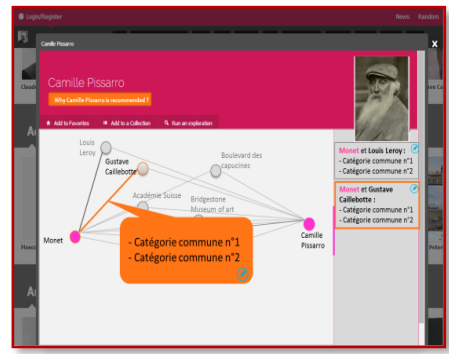
- Fabien GANDON, Inria, AI, KR, Semantic Web, Social Web
- Nhan LE THANH, UNS, Logics, KR, Emotions
- Peter SANDER, UNS, Web, Emotions
- Andrea TETTAMANZI, UNS, AI, Logics, Agents,

### **CR/Assistant Professors:**

- Michel BUFFA, UNS, Web, Social Media
- Elena CABRIO, UNS, NLP, KR, Linguistics
- Olivier CORBY, Inria, KR, AI, Sem. Web, Programming, Graphs
- Catherine FARON-ZUCKER, UNS, KR, AI, Semantic Web, Graphs
- Alain GIBOIN, Inria, Interaction Design, KE, User & Task models
- Isabelle MIRBEL, UNS, Requirements, Communities
- Serena VILLATA, CNRS, AI, Argumentation, Licenses, Rights

**Inria Starting Position:** Alexandre MONNIN, Philosophy, Web

1

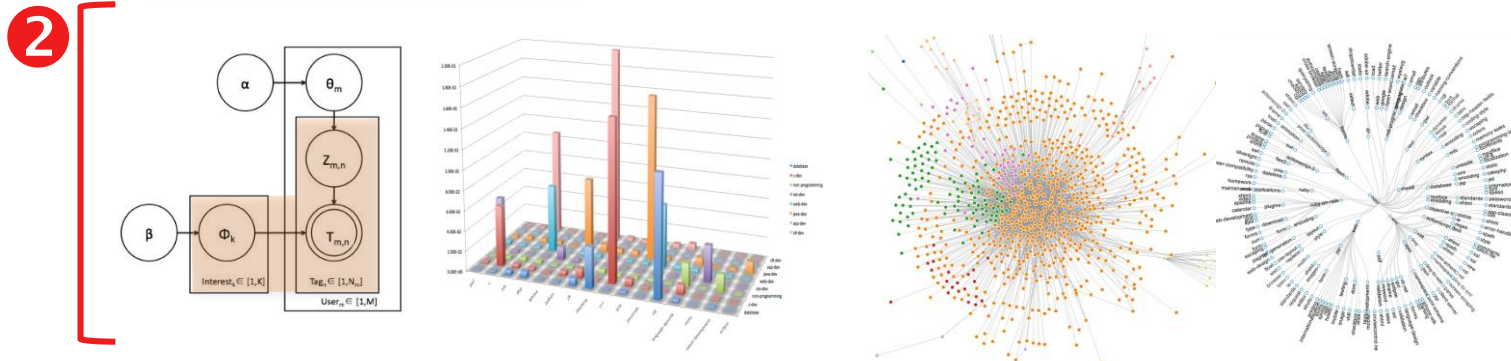
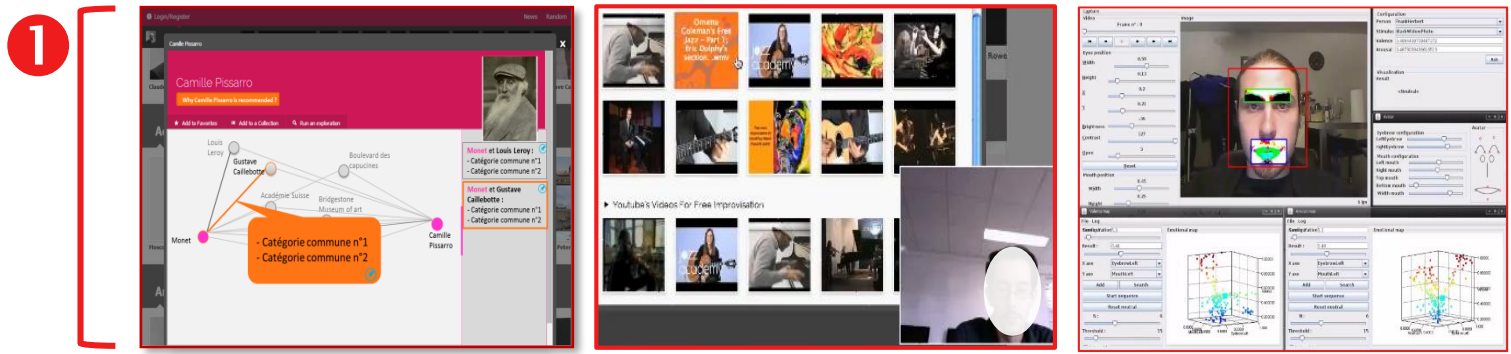


# METHODS AND TOOLS

## 1. user & interaction design

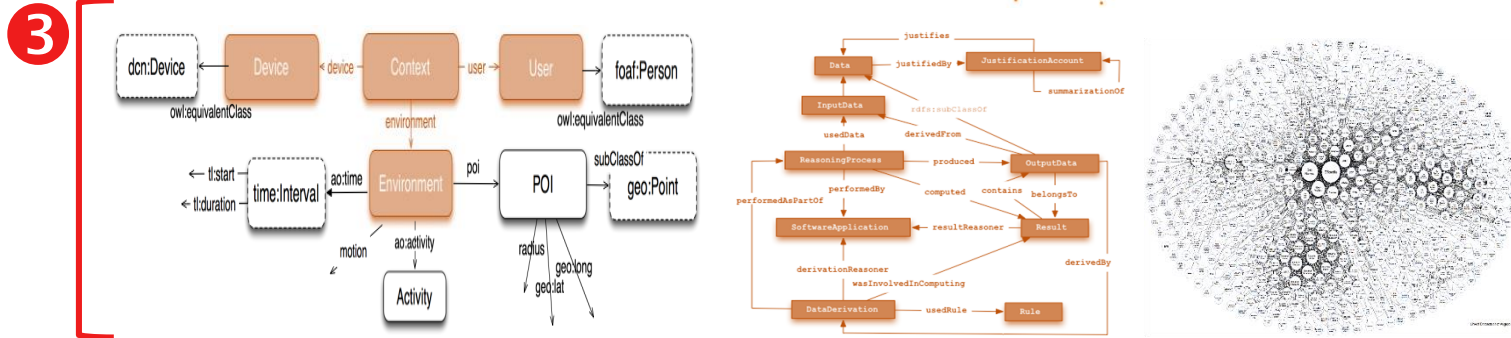
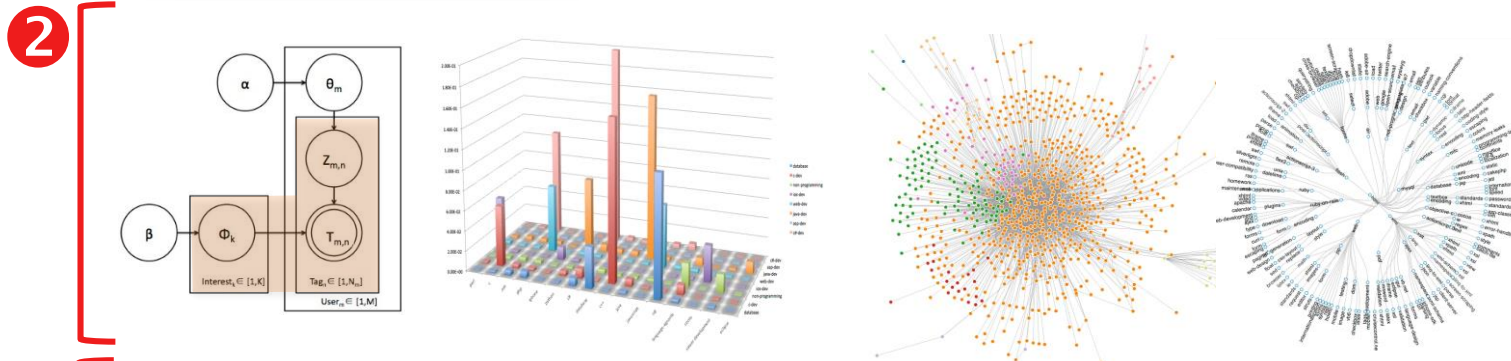
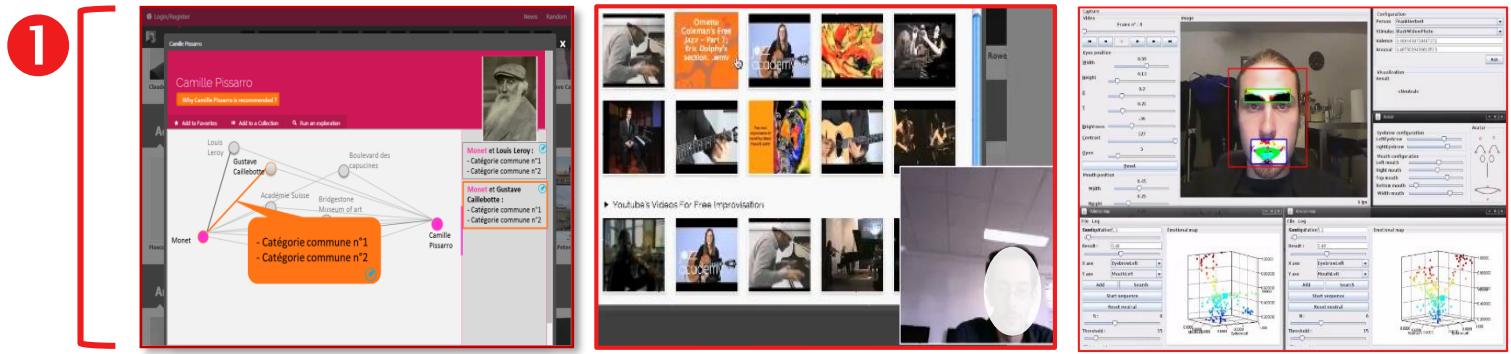
# METHODS AND TOOLS

1. user & interaction design
2. communities & social medias



# METHODS AND TOOLS

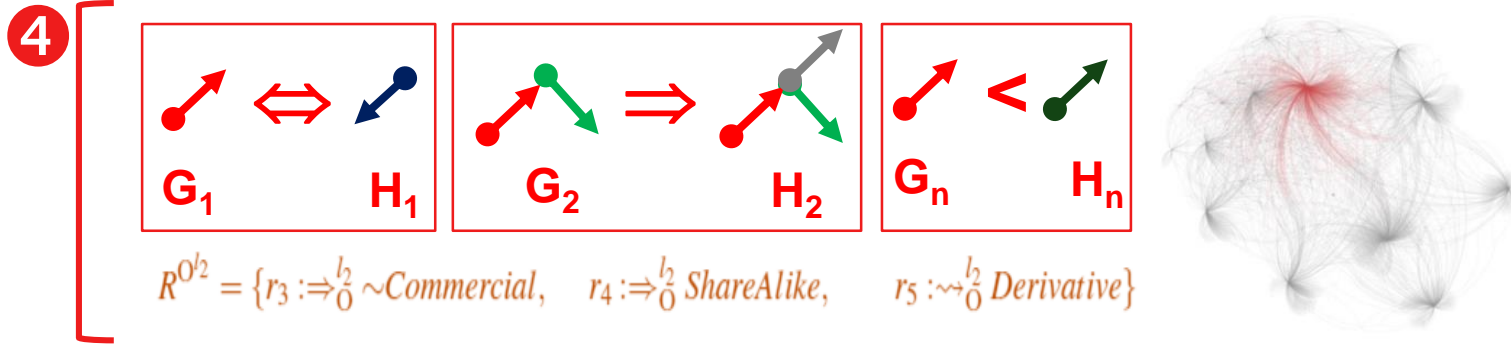
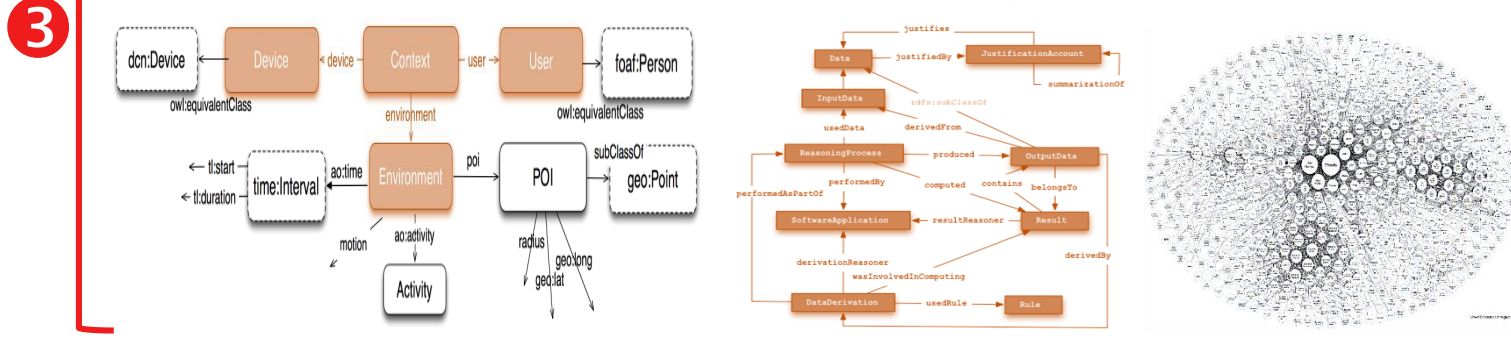
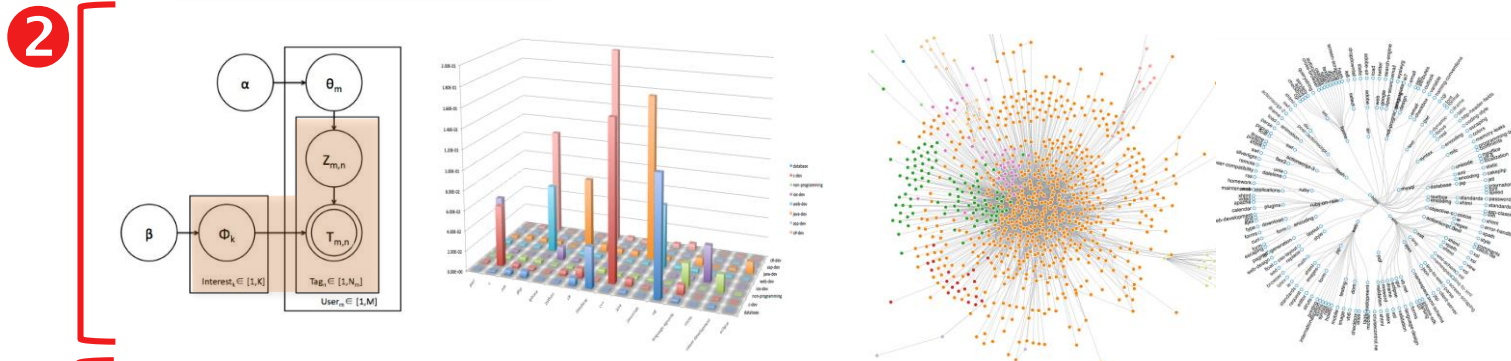
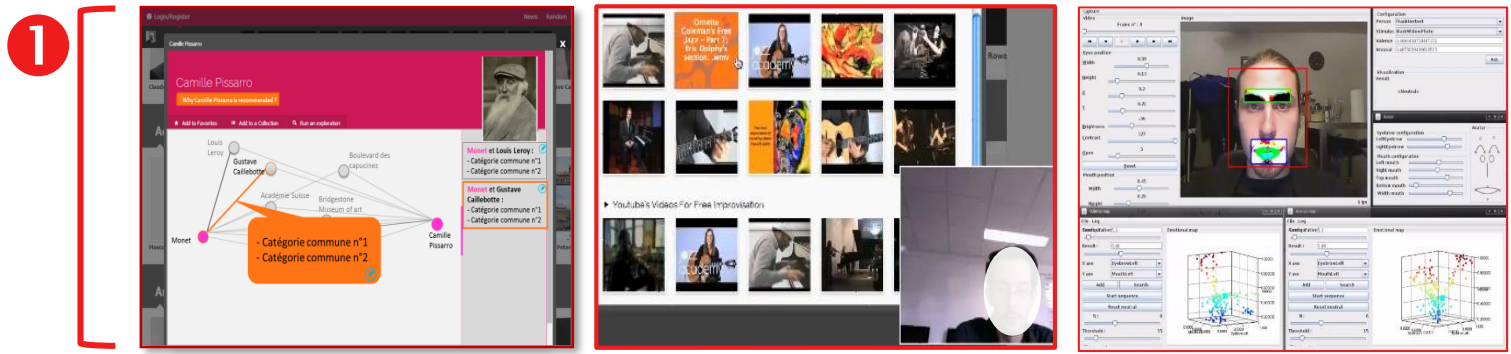
1. user & interaction design
2. communities & social medias
3. linked data & semantic Web





# METHODS AND TOOLS

1. user & interaction design
2. communities & social medias
3. linked data & semantic Web
4. reasoning & analyzing





cultural data is a weapon of mass construction

185 377 686 RDF triples extracted and mapped

DBpedia

Search DBpedia

http://fr.dbpedia.org

français, langue fr

### Paris

Location, lieu, lieu habité, zone peuplée

Paris (prononcé [pa.ʁi]) est la capitale de la France. Elle se situe au cœur d'une vaste plaine fertile au climat tempéré, le Bassin parisien, sur une boucle de la Seine, entre les confluents de celle-ci avec la Marne et l'Oise. Ses habitants s'appellent les Parisiens. Paris est également le chef-lieu de la région Île-de-France et l'unique commune française qui est en même temps un département. Comme les villes de Lyon et de Marseille, elle est divisée en arrondissements (au nombre de vingt).

dbpedia - rdf.freebase.com/ns/m.05qj - fr.wikipedia.org/wiki/Paris

Property: Value

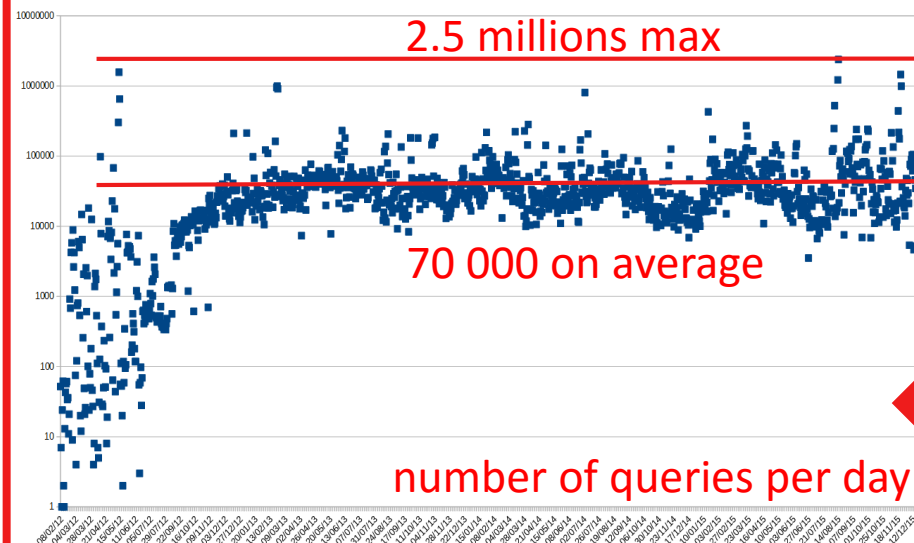
dbpedia-owl:abstract : Paris (prononcé [pa.ʁi]) est la capitale de la France. Elle se situe au cœur d'une vaste plaine fertile au climat tempéré, le Bassin parisien, sur une boucle de la Seine, entre les confluents de celle-ci avec la Marne et l'Oise. Ses habitants s'appellent les Parisiens. Paris est également le chef-lieu de la région Île-de-France et l'unique commune française qui est en même temps un département. Comme les villes de Lyon et de Marseille, elle est divisée en arrondissements (au nombre de vingt). Elle possède un préfet de police. Ville longtemps la plus peuplée d'Europe, elle reste la plus peuplée de France. D'après le recensement de

dbpedia-owl:bnfid :	152821567 (xsd:string)
dbpedia-owl:canton :	dbpedia-fr:Chef-lieu
dbpedia-owl:country :	dbpedia-fr:France
dbpedia-owl:department :	dbpedia-fr:Préfecture
dbpedia-owl:flag :	Marie De Paris.svg (xsd:string)
dbpedia-owl:flagCaption :	Paris#Héraldique, logotype et devise (xsd:string)
dbpedia-owl:geolocDepartment :	dbpedia-fr:Arrondissement_de_Paris
dbpedia-owl:geolocCountry :	dbpedia-fr:France
dbpedia-owl:geolocRegion :	dbpedia-fr:Île-de-France
dbpedia-owl:inseeCode :	75056 et de75101 à 75120 (xsd:string)
dbpedia-owl:iccnid :	n/79/058874 (xsd:string)
dbpedia-owl:peopleName :	Parisiens @fr
dbpedia-owl:politicalLeader :	dbpedia-fr:Paris_1
dbpedia-owl:populationTotal :	2240621 (xsd:nonNegativeInteger)
dbpedia-owl:postalCode :	75001 à 75020 et 75116 (xsd:string)
dbpedia-owl:region :	dbpedia-fr:Île-de-France
dbpedia-owl:sudocid :	080467008 (xsd:string)
dbpedia-owl:thumbnail :	http://commons.wikimedia.org/wiki/Special:FilePath/Paris_-_Effetturn_und_Miarsteid2.jpg?width=300
dbpedia-owl:thumbnailCaption :	Latour Eiffel et les gratte-ciel de la Défense en arrière-plan. (xsd:string)
dbpedia-owl:viafid :	158822968 (xsd:string)

public dumps, endpoints, interfaces, APIs...

# PUBLISHING

e.g. DBpedia.fr



Flint SPARQL Editor 1.0.3

New Edit View Help

Dataset http://dbpedia-test-fr.inria.fr/sparql Mode SPARQL 1.0 Output SP

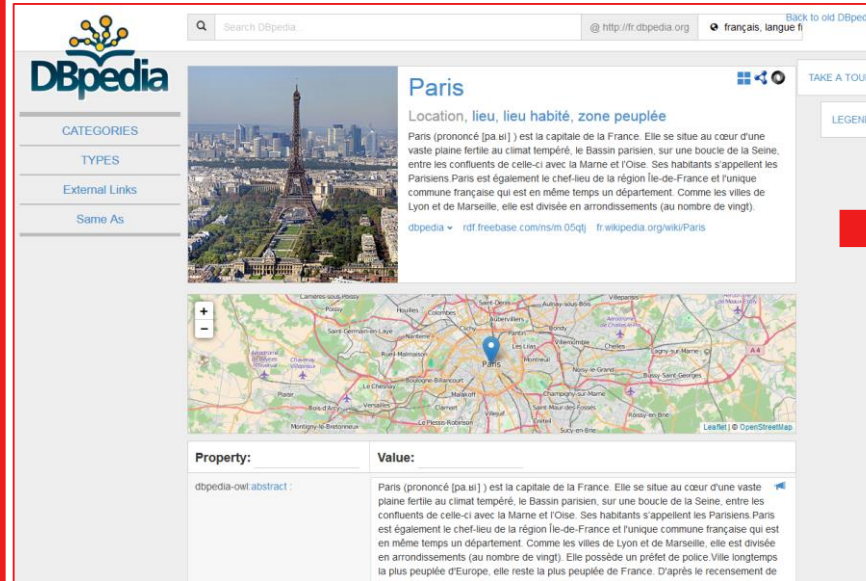
Query 1

```

1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
3
4 SELECT * WHERE {
5   ?s ?p ?o
6 }
7 LIMIT 10

```

## 2.5 billion RDF triples of versioning activities



The screenshot shows the DBpedia page for Paris. It includes a search bar at the top, a map of Paris, and a text description of the city. The text describes Paris as the capital of France, located on the banks of the Seine river, and mentions its history and population.

```
<http://fr.dbpedia.org/Réaux>  
a prov:Revision ;  
swp:isVersion "96"^^xsd:integer ;  
dc:created "2005-08-05T07:27:07"^^xsd:dateTime ;  
dc:modified "2015-01-06T10:26:35"^^xsd:dateTime ;  
dbfr:uniqueContributorNb 58 ;
```

```
dbfr:revPerYear [ dc:date "2005"^^xsd:gYear ; rdf:value  
"2"^^xsd:integer ] ;
```

```
...  
dbfr:revPerYear [ dc:date "2015"^^xsd:gYear ; rdf:value  
"1"^^xsd:integer ] ;
```

```
dbfr:revPerMonth [ dc:date "08/2005"^^xsd:gYearMonth ;  
rdf:value "1"^^xsd:integer ] ;
```

```
...  
dbfr:revPerMonth [ dc:date "01/2015"^^xsd:gYearMonth ;  
rdf:value "1"^^xsd:integer ] ;
```

```
dbfr:averageSizePerMonth [ dc:date  
"08/2005"^^xsd:gYearMonth ; rdf:value "3060"^^xsd:float ] ;
```

```
...  
dbfr:averageSizePerYear [ dc:date "2015"^^xsd:gYear ;  
rdf:value "4767"^^xsd:float ] ;
```

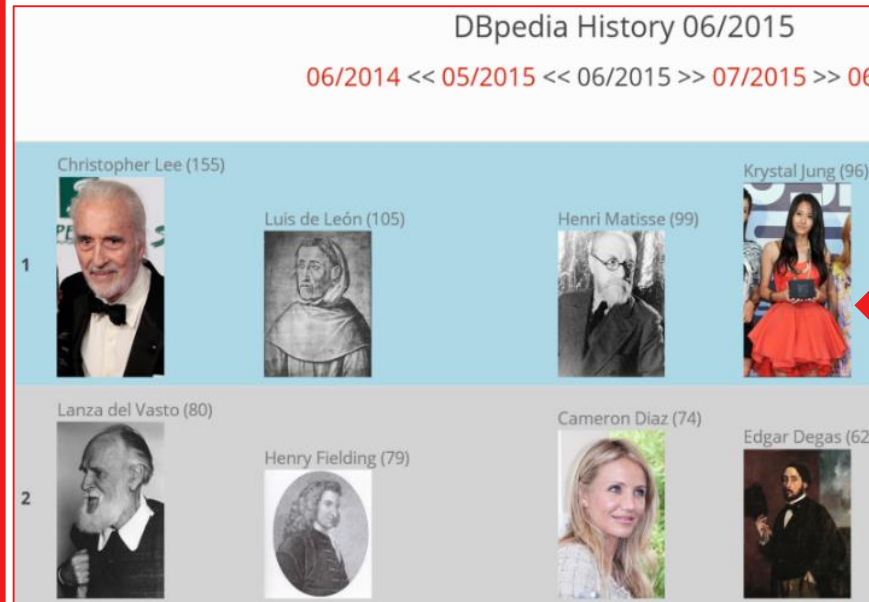
```
dbfr:averageSizePerMonth [ dc:date  
"08/2005"^^xsd:gYearMonth ; rdf:value "3060"^^xsd:float ] ;
```

```
...  
dbfr:averageSizePerMonth [ dc:date  
"01/2015"^^xsd:gYearMonth ; rdf:value "4767"^^xsd:float ] ;
```

```
dbfr:size "4767"^^xsd:integer ;  
dc:creator [ foaf:name "DasBot" ; rdf:type  
scoro:ComputationalAgent ] ;  
sioc:note "Robot : Remplacement de texte automatisé (-  
[[commune française|+[[commune (France)|]]"^^xsd:string ;  
prov:wasRevisionOf  
<https://fr.wikipedia.org/w/index.php?title=Réaux&oldid=103  
441506> ;  
prov:wasAttributedTo [ foaf:name "Escarbot" ; a  
prov:SoftwareAgent ] .
```

# HISTORIC

extending DBpedia



The screenshot shows the DBpedia History 06/2015 page. It features a navigation bar with dates: 06/2014 << 05/2015 << 06/2015 >> 07/2015 >> 06/2016. Below the navigation bar, there are two rows of historical figures. The first row includes Christopher Lee (155), Luis de León (105), Henri Matisse (99), and Krystal Jung (96). The second row includes Lanza del Vasto (80), Henry Fielding (79), Cameron Diaz (74), and Edgar Degas (62). Each figure is accompanied by a small portrait or image.

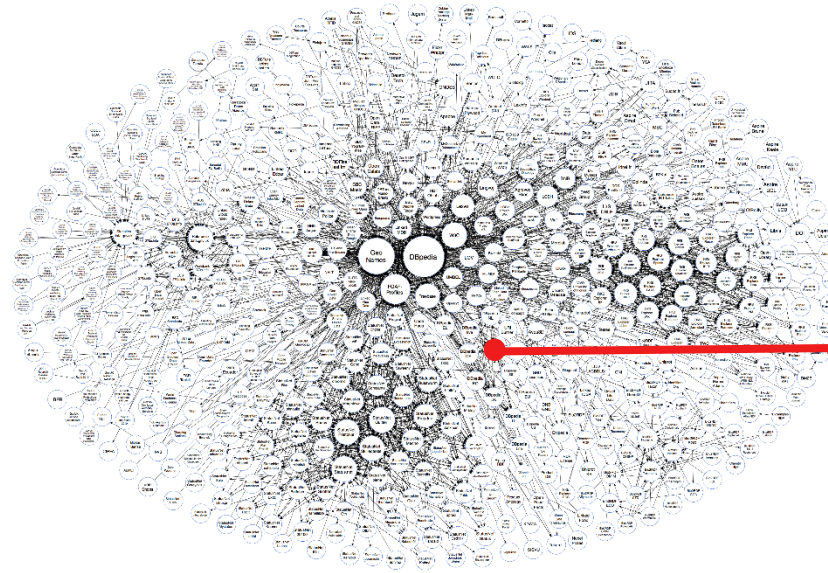
“searching” comes in many flavors



# SEARCHING

---

- exploratory search
- question-answering



**DBPEDIA.FR** (extraction, end-point)

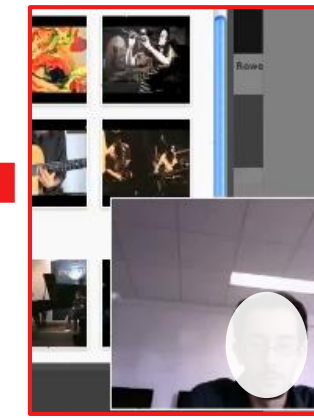
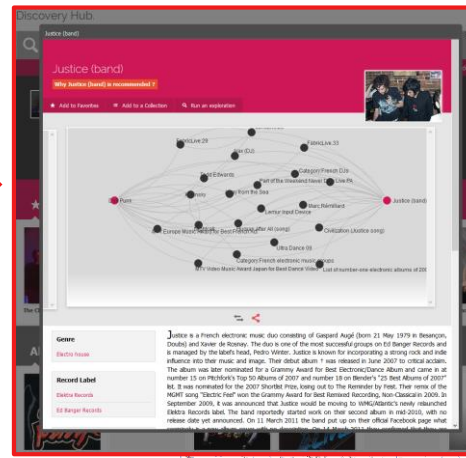
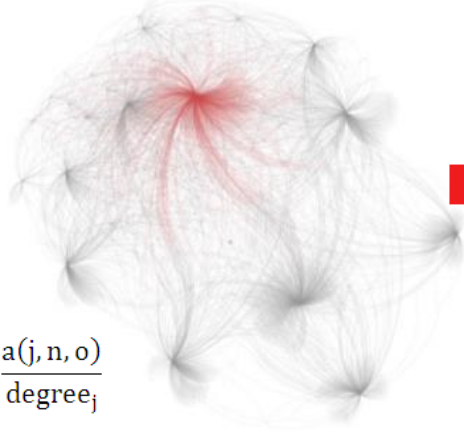
180 000 000 triples

[Cojan, Boyer et al.]

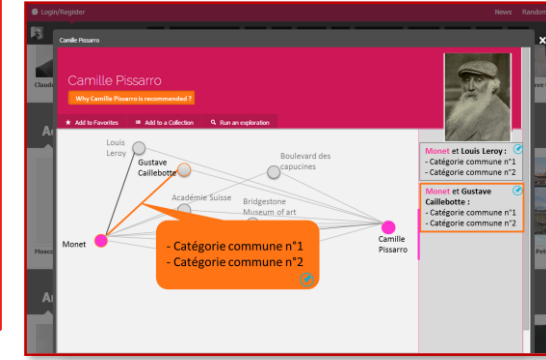
# semantic spreading activation

$$a(i, n) = \prod_{o \in O} [a(i, n, o)] / \log(\text{degree}_i)$$

$$a(i, n + 1, o) = s(i, n, o) + \sum_j w(i, o) * \frac{a(j, n, o)}{\text{degree}_j}$$



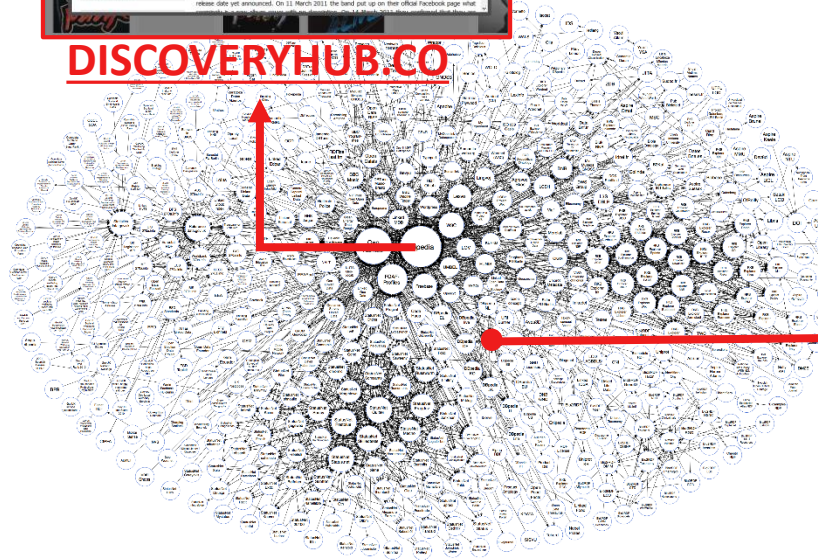
# new evaluation protocol



[Marie, Giboin, Palagi et al.]

# SEARCHING

- exploratory search
- question-answering



**DISCOVERYHUB.CO**

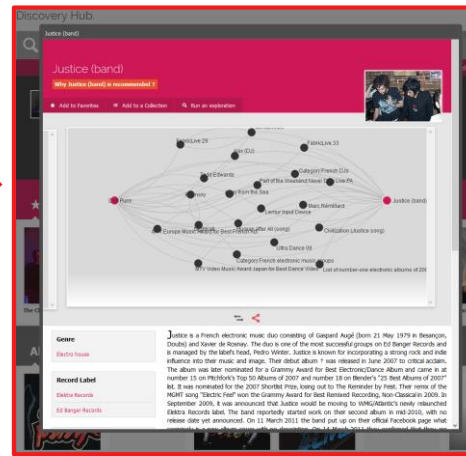
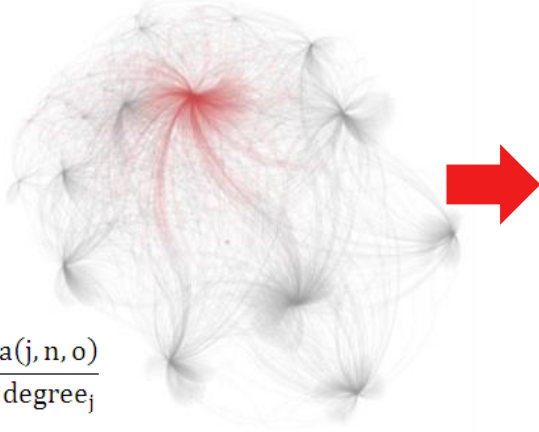
**DBPEDIA.FR** (extraction, end-point)  
180 000 000 triples

[Cojan, Boyer et al.]

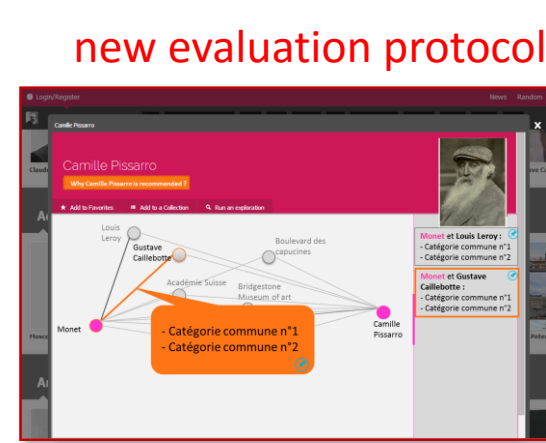
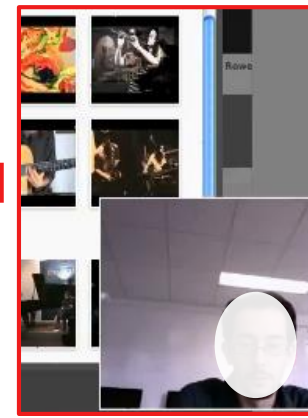
# semantic spreading activation

$$a(i, n) = \prod_{o \in O} [a(i, n, o)] / \log(\text{degree}_i)$$

$$a(i, n + 1, o) = s(i, n, o) + \sum_j w(i, o) * \frac{a(j, n, o)}{\text{degree}_j}$$



DISCOVERYHUB.CO

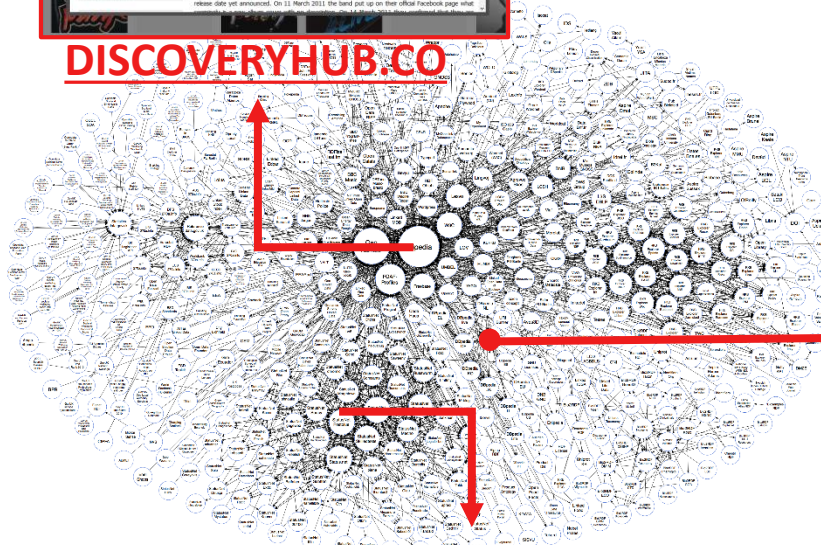


# new evaluation protocol

[Marie, Giboin, Palagi et al.]

# SEARCHING

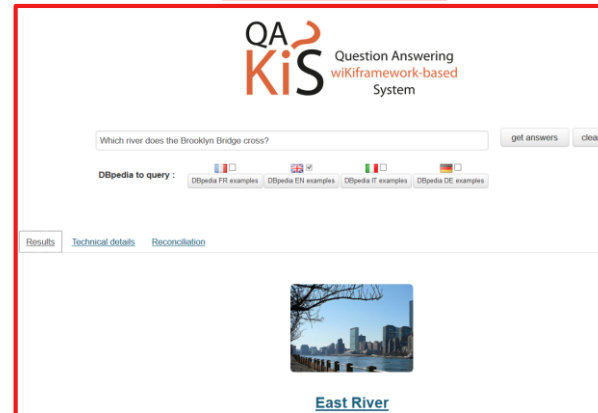
- exploratory search
- question-answering



DBPEDIA.FR (extraction, end-point)  
180 000 000 triples

[Cojan, Boyer et al.]

QAKIS.ORG



named entity recognition  
similarity based SPARQL  
generation

```
select * where {
  dbpr:Batman_Begins dbp:starring ?v .
  OPTIONAL {?v rdfs:label ?l
    filter(lang(?l)="en") } }
```

[Cabrio et al.]



linguistic relational  
pattern extraction

*starring(Work, Person)*  
[D:Work], played by [R:Person]  
[D:Work] stars [R:Person]  
[D:Work] film stars [R:Person]



# BROWSING

e.g. SMILK plugin

[Lopez, Cabrio, et al.]

The screenshot displays a web browser window with several tabs. The active tab shows an article from [www.ladepeche.fr](http://www.ladepeche.fr) titled "la-modernite-version-dior-entre-18eme-siecle-et-futurisme.html". The article text discusses a fashion collection by Christian Dior inspired by the 18th century and futurism, mentioning a show at the Louvre and a collection of modern, futuristic clothing.

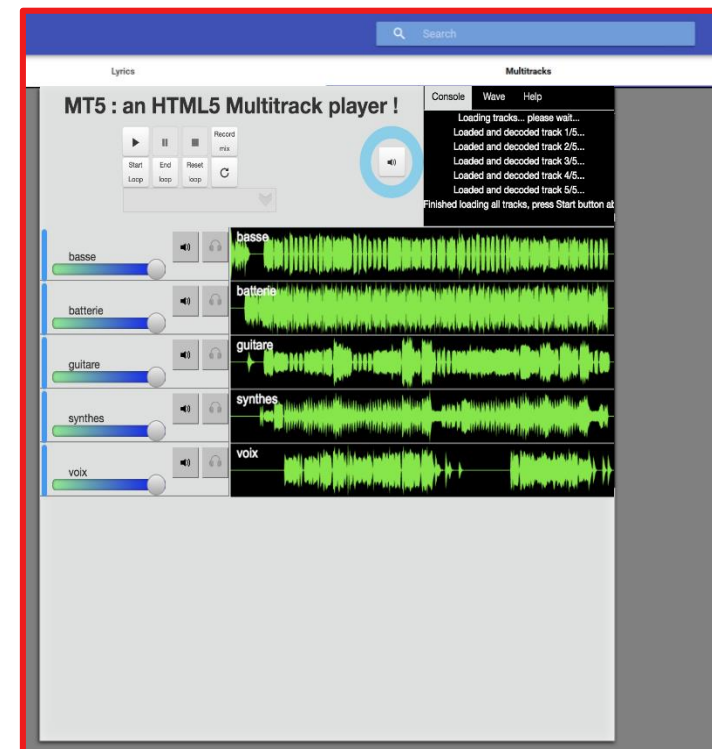
On the left side of the browser, a sidebar for the "SMILK" plugin is visible. It features a logo with puzzle pieces and the text "SMILK Social Media Intelligence and Linked Knowledge". Below the logo, there are sections for "Groupe" (listing LVMH) and "Marque" (listing Loewe, Christian Dior, Dior, and JW Anderson).

In the center, a network diagram shows a central node labeled "Chanel" connected to various other nodes. The nodes include "Bleu", "Rouge Coco", "Coco Noir", "Allure Homme Sport", "Eau Extrême", "Logo", "Produits", "site Web", "Résumé", "clouds", "NetSentOpinionFil", and "NetSentConceptCloud".

On the right side, a "NetSent" analysis is shown. It includes a word cloud with terms like "Dior", "Chanel", "Diorshow", "Waterproof", "Iconic", "Maybelline", "Avene", "Clarins", "Carita", "Gaudalie", "Night Shine", "Sisley", "Peggy Sage", "Nivea", "Bourjois", "Waterproof", "Diory", "Shiseido", "Fellai", "Lancôme", "Kenzohi", "Estée Lauder", "GlossAppeal", "GlossAppeal", "Diorshow Iconic Extreme", and "Christian Dior". To the right of the word cloud is a bar chart showing the distribution of sentiment scores: 26 for "Positive" and 11 for "Negative".

# WASABI

augmenting musical  
experience with the Web



[Buffa, Jauva et al.]

**PAINT IT, BLACK**  
ARTIST: THE ROLLING STONES  
ALBUM: ROLL'D GOLD

Spotify MusicBrainz iTunes Amazon GoEar  
Runtime: 2:02.0, 2:44.0, 2:25.0  
Format: Gramophone record  
Genre: Psychedelic rock, Psychedelic music, Latin music, (genre) Rhythm and blues, Raga rock, Funk  
Producer: Andrew Loog Oldham, Jerry Goldstein (producer)  
Record label: Liberty Records, Decca Records, London Records  
Writer: Jagger/Richards  
Recorded: 1970-02-08  
Release Date: 1966-05-07, 1966-05-13

Abstract: "Paint It Black" (originally released as "Paint It, Black") is a song by the English rock band The Rolling Stones, written by the songwriting partnership of Mick Jagger and Keith Richards, and first released as a single on 6 May 1966 (see 1966 in music). It was later included as the opening track to the U.S. version of their 1966 album, *Aftermath*. Musically inspired by the sitar playing of George Harrison and Harhar Rao, "Paint It Black", along with the Jagger and Richards-penned "Mother's Little Helper", was influential in developing the musical styles of psychedelic rock and raga rock. "Paint It Black" reached number one in both the Billboard Hot 100 and UK Singles Chart. The song became The Rolling Stones' third number one hit single in the US and sixth in the UK. Since its initial release, the song has remained influential as the first number one hit featuring a sitar, particularly in the UK where it has charted in two other instances, and has been the subject of multiple cover versions, compilation albums, and film appearances.

I see a red door and I want it painted black  
No colours anymore, I want them to turn black  
I see the girls walk by dressed in their summer clothes  
I have to turn my head until my darkness goes

I see a line of cars and they're all painted black  
With flowers and my love both never to come back  
I see people turn their heads and quickly look away  
Like a newborn baby, it just happens every day

I look inside myself and see my heart is black  
I see my red door and must have it painted black

## The Rolling Stones



**Années d'activité:** 1962-present  
**Localisation:** England, London  
**Genre:** Rock, Rock 'N' Roll, R&B, Blues, Hard Rock  
**Label:** ABKCO, Decca Records, Interscope Records, London Records, Polydor, Rolling Stones Records, Virgin Records  
▶ Voir les membres actuels:  
▼ Voir les ancien(s) membre(s):

- Brian Jones
  - Instrument: guitar
  - Années d'activités: 1962-1969
- Mick Taylor
  - Instrument: guitar
  - Années d'activités: 1969-1974
- Ian Stewart
  - Instrument: keyboarde
  - Années d'activités: 1962-1963
- Dick Taylor
  - Instrument: bass
  - Années d'activités: 1962-1963
- Bill Wyman
  - Instrument: bass
  - Années d'activités: 1963-1993
- Tony Chapman
  - Instrument: drums
  - Années d'activités: 1962-1962

Album: GRRR! 2012

# ZOOMATHIA

Cultural transmission of  
zoological knowledge  
from Antiquity  
to Middle Age

[Faron Zucker, et al.]

Nom de référence	Synonymes / Chrésonymes	Nom vernaculaire	Fiche de l'espèce
<i>Delphinus delphis</i> Linnaeus, 1758	<i>Delphinus delphis</i> Linnaeus, 1758	Dauphin commun à bec court, Dauphin commun	<a href="#">Fiche</a>
<i>Stenella coeruleoalba</i> (Meyen, 1833)	<i>Delphinus delphis mediterranea</i> Nobre, 1900	Dauphin bleu et blanc	<a href="#">Fiche</a>

**Recherche de données**

*Delphinus delphis* Linnaeus, 1758

Dauphin commun à bec court, Dauphin commun ( Français )

Common Dolphin (English)

(Chordata, Mammalia, Cetacea)

Paléolithique Mésoolithique Néolithique Age du Bronze Age du Fer Antiquité Moyen Âge

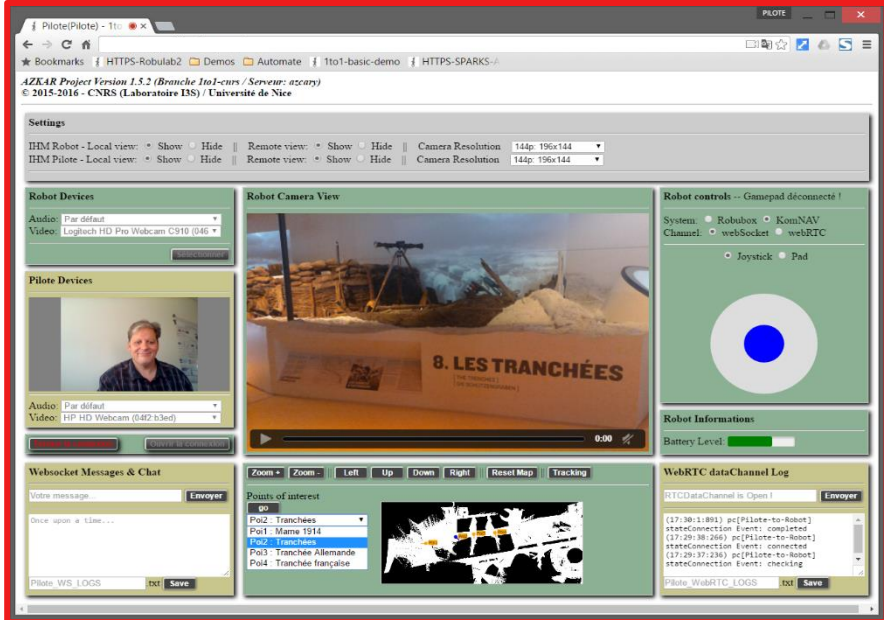
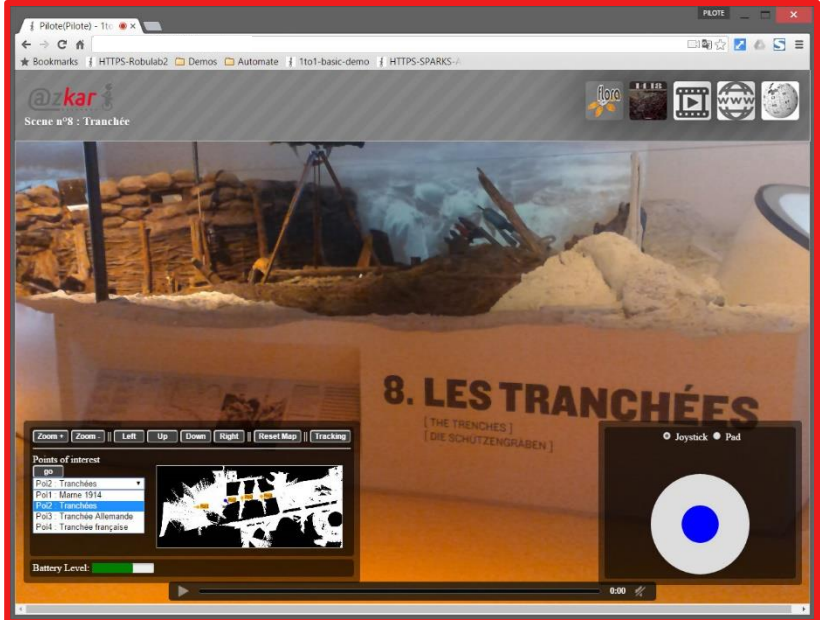
ancien moyen supérieur ancien moyen supérieur Hallstat La Tène haut central bas

Zoom sur : France métropolitaine et d'outre-mer

Rechercher

Rechercher près de chez vous.

Paléolithique  
 ancien  
 moyen  
 supérieur  
 Mésoolithique  
 Néolithique  
 ancien  
 moyen  
 final  
 Age du Bronze  
 Age du Fer  
 Hallstat  
 La Tène  
 Antiquité  
 Moyen-Age  
 Haut Moyen-Age  
 Moyen-Age-central  
 Bas Moyen-Age  
 Temps modernes



# AZKAR

remotely visit and interact with a museum through a robot and via the Web



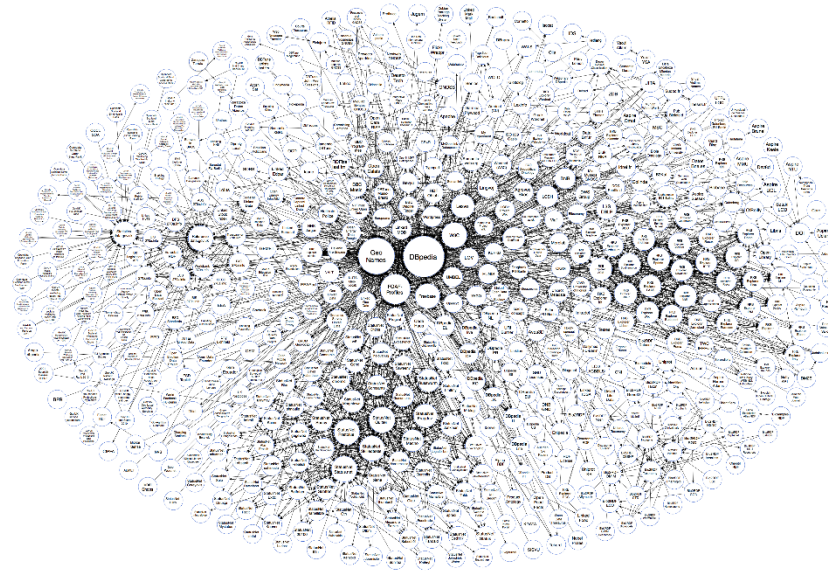


# users & interaction

# MODELING USERS

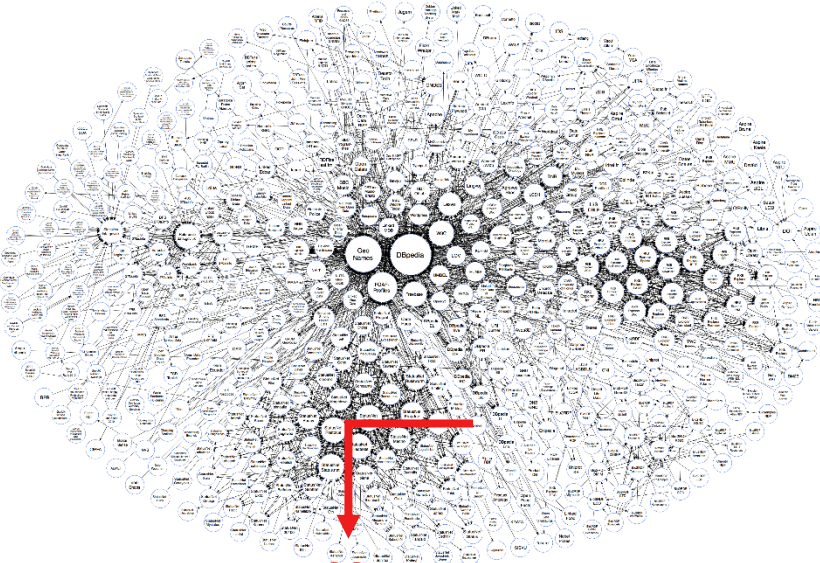
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- individual context
- social structures

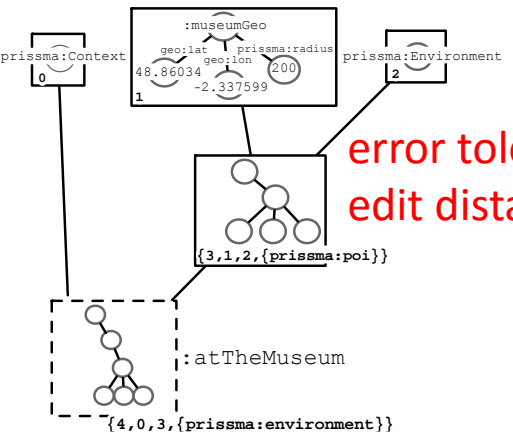


# MODELING USERS

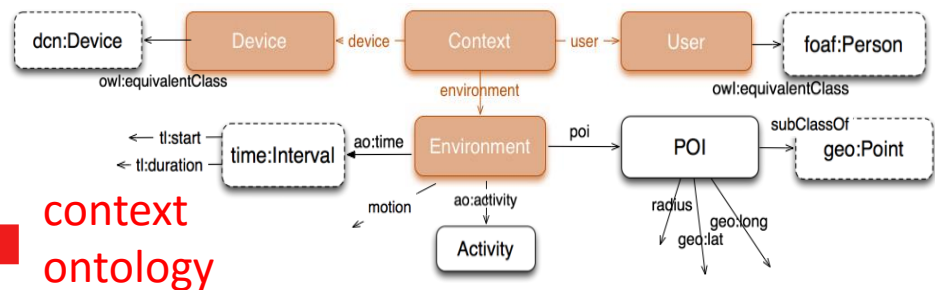
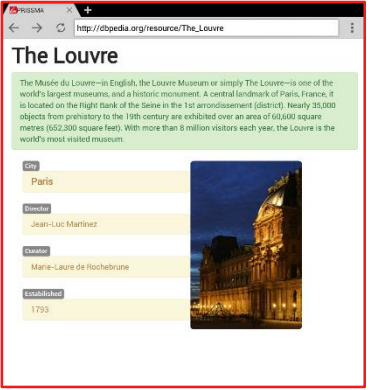
- individual context
- social structures



**PRISSMA**

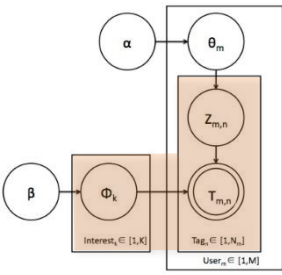


error tolerant graph  
edit distance

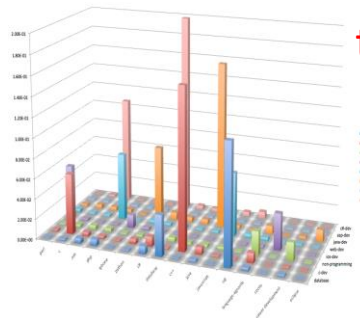


context  
ontology

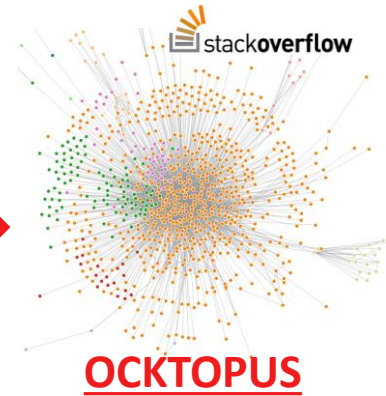
[Costabello et al.]



[Meng et al.]

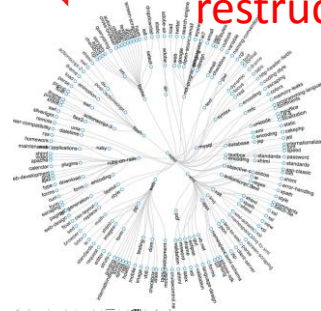


tag, topic, user distribution



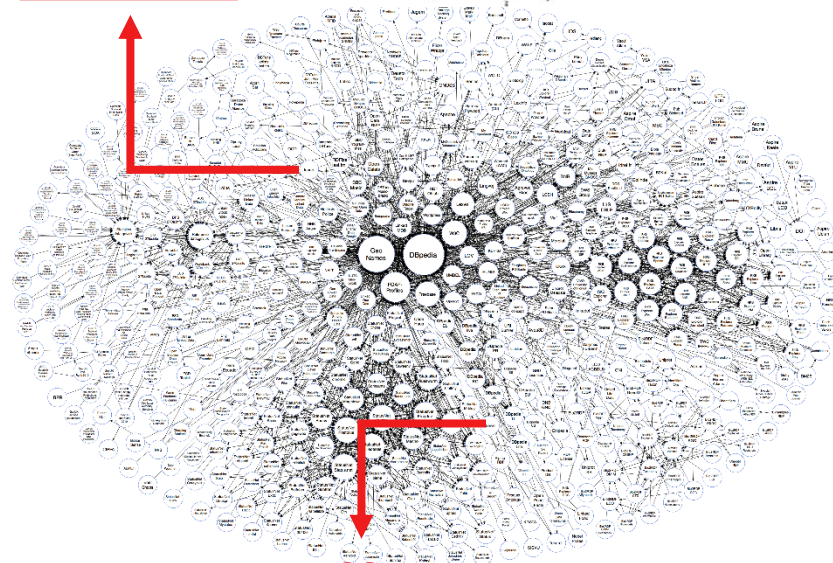
**OCKTOPUS**

tag and folksonomy restructuring with prefix trees

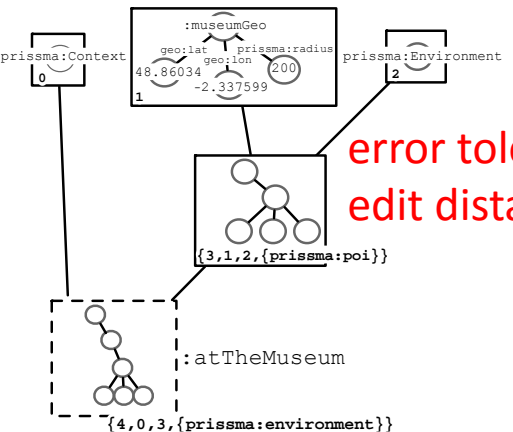


# MODELING USERS

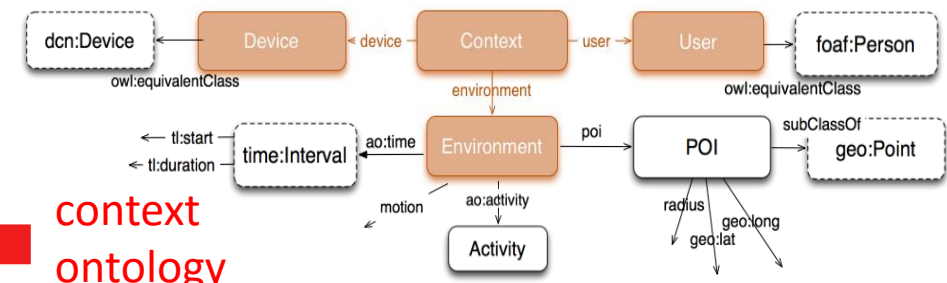
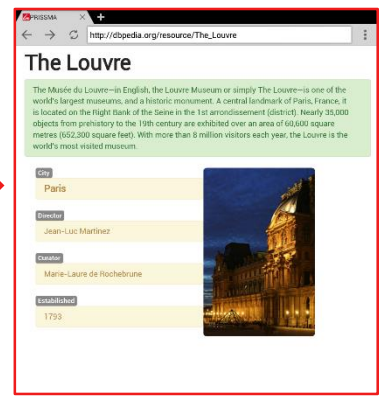
- individual context
- social structures



**PRISMA**



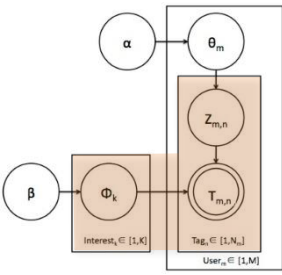
error tolerant graph edit distance



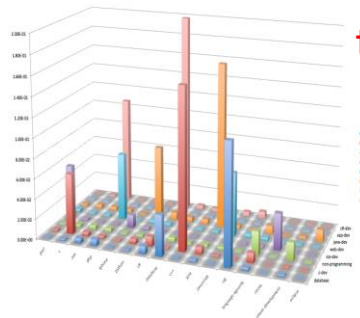
context ontology

[Costabello et al.]

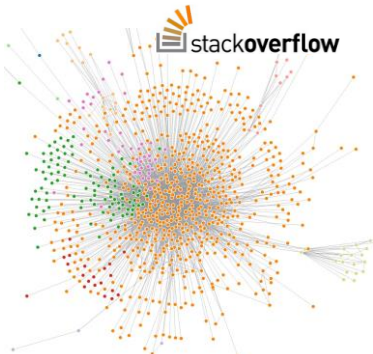




[Meng et al.]

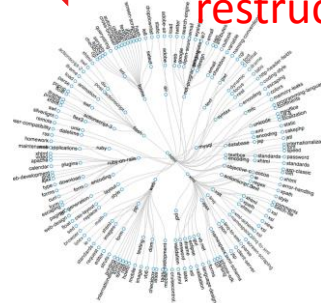


tag, topic, user distribution



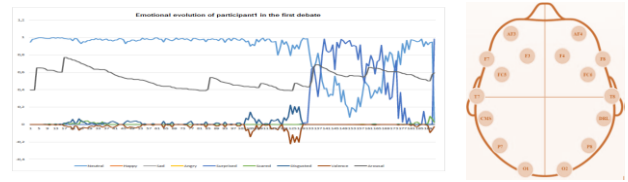
OCKTOPUS

tag and folksonomy restructuring with prefix trees

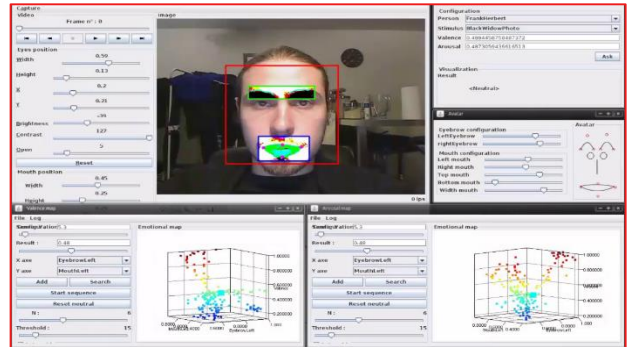


[Villata, Cabrio et al.]

EMOCA&SEEMPAD



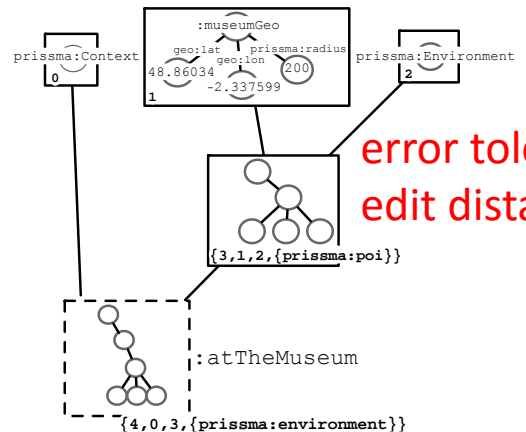
emotion detection & annotation



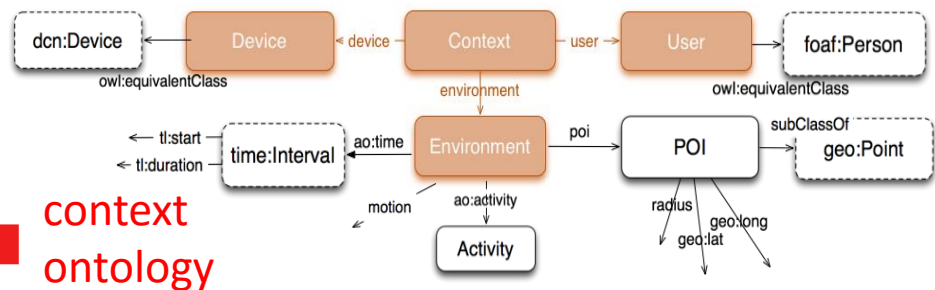
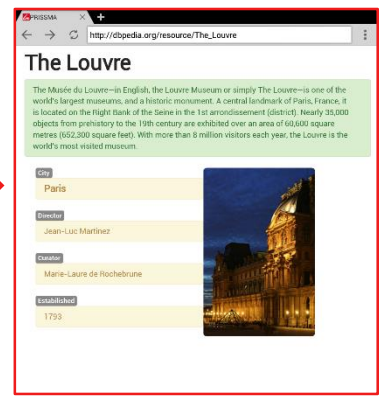
PRISSMA

# MODELING USERS

- individual context
- social structures

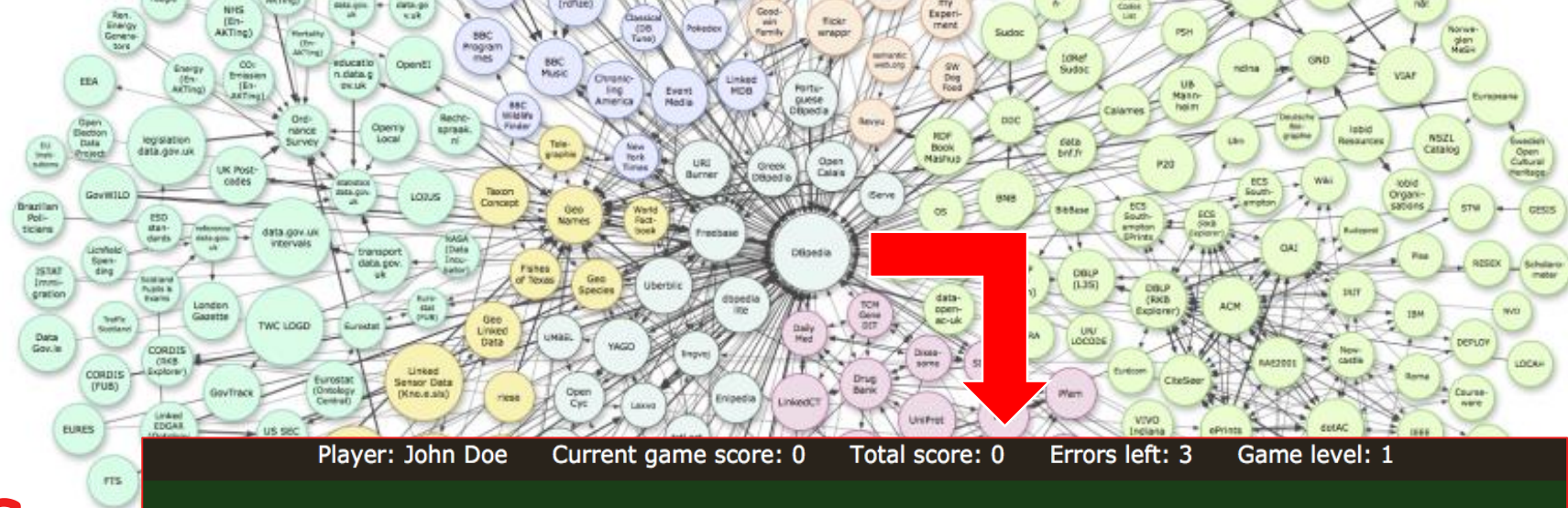


error tolerant graph edit distance



context ontology

[Costabello et al.]



Player: John Doe    Current game score: 0    Total score: 0    Errors left: 3    Game level: 1


# MODELING USERS

e.g. e-learning & serious games

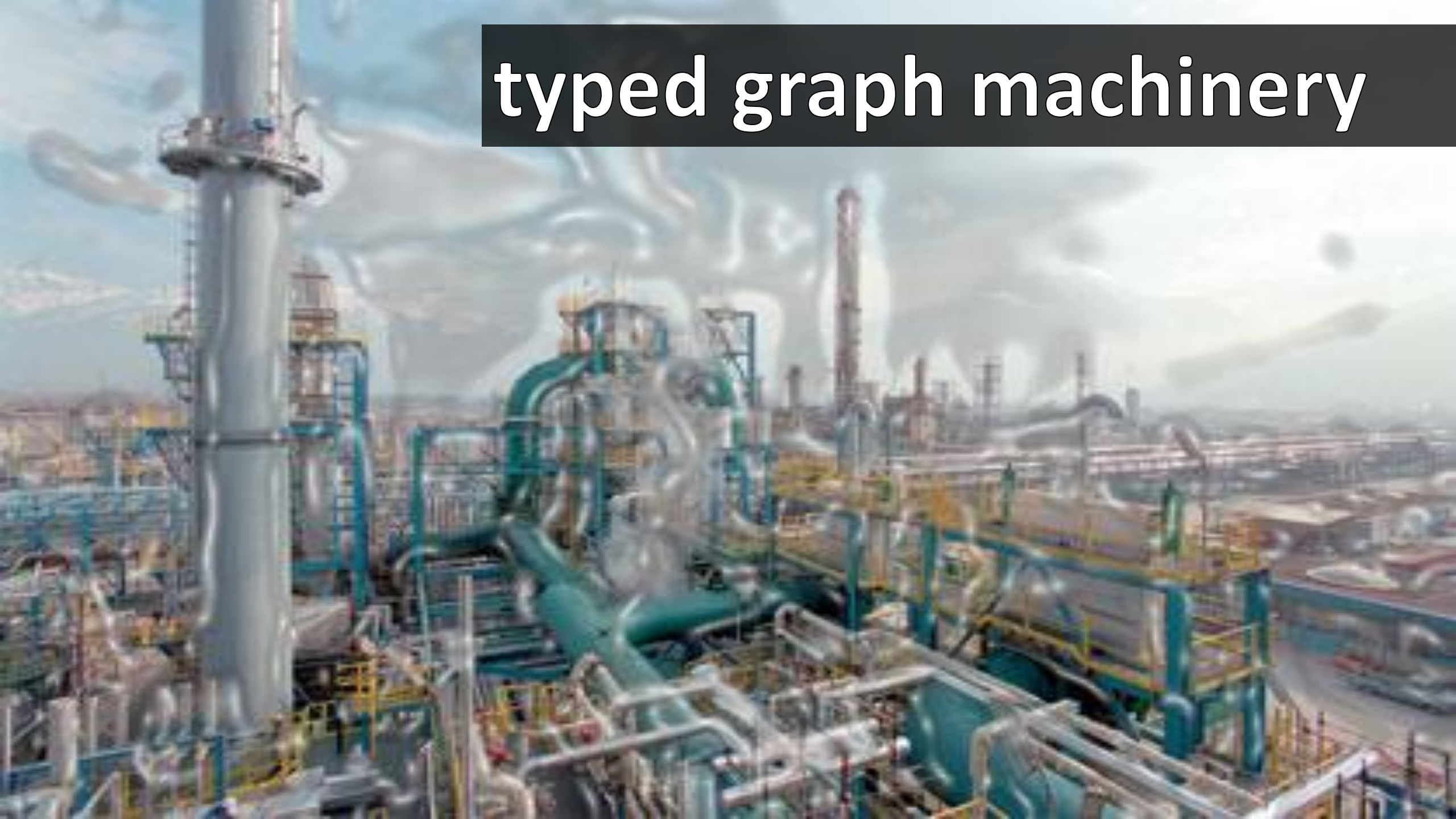
[Rodriguez-Rocha, Faron-Zucker et al.]

Start	100	300	100	End
	300		300	
200				300
200				100
200				50
50		200		
50	300	300		

**For 200 points:**  
**What is the capital of Austria?**



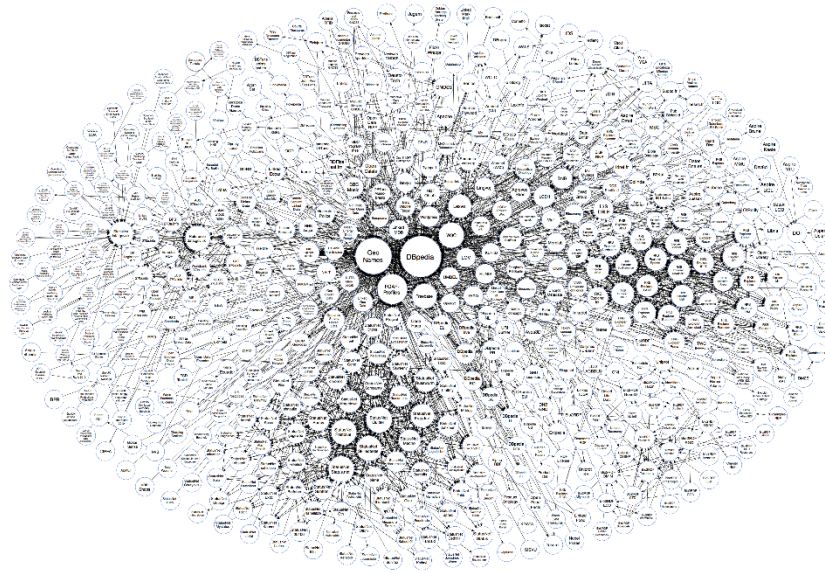
**typed graph machinery**

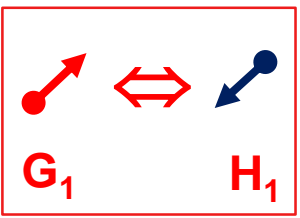


# QUERY & INFER

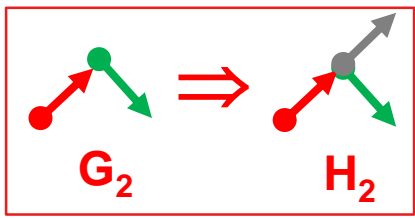
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- graph rules and queries
- deontic reasoning
- induction

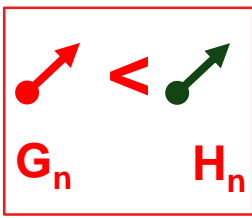




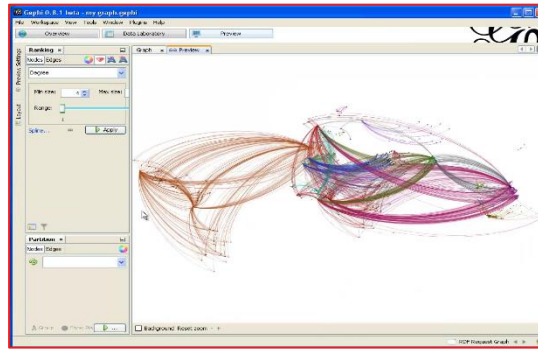
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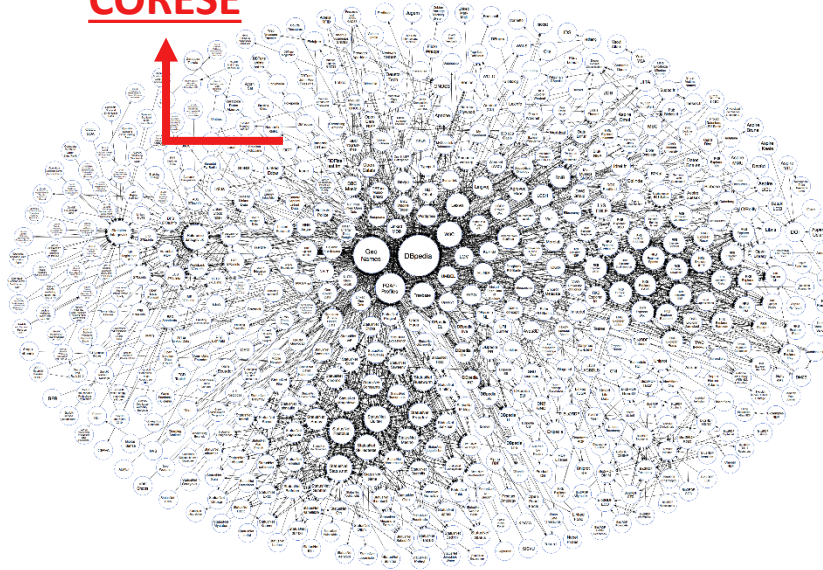
&



abstract graph machine  
STTL



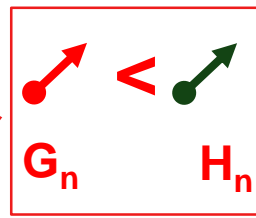
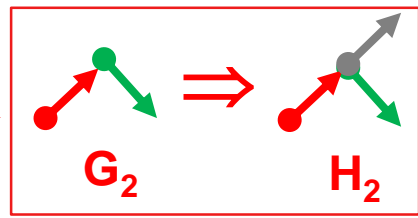
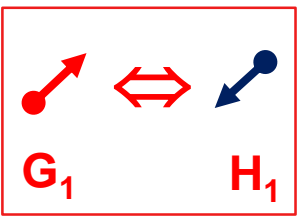
CORESE



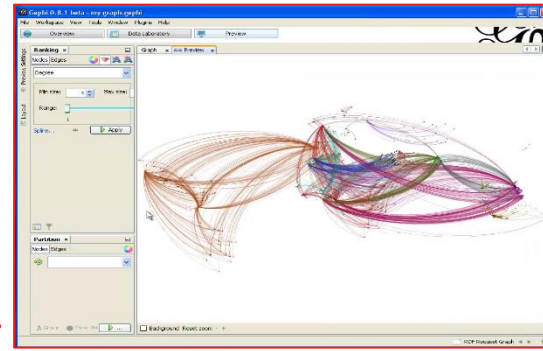
[Corby, Faron-Zucker et al.]

# QUERY & INFER

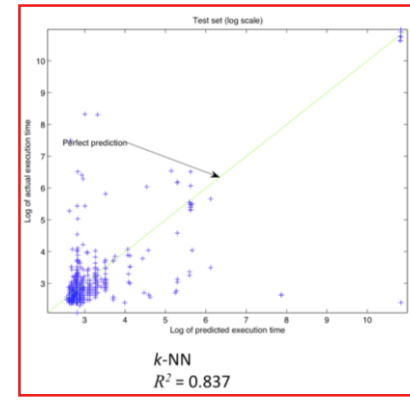
- graph rules and queries
- deontic reasoning
- induction



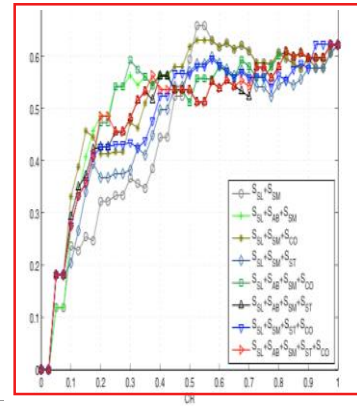
abstract graph machine  
STTL



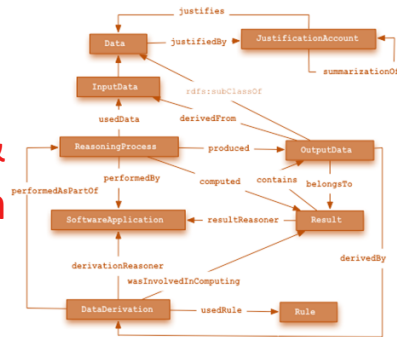
CORESE



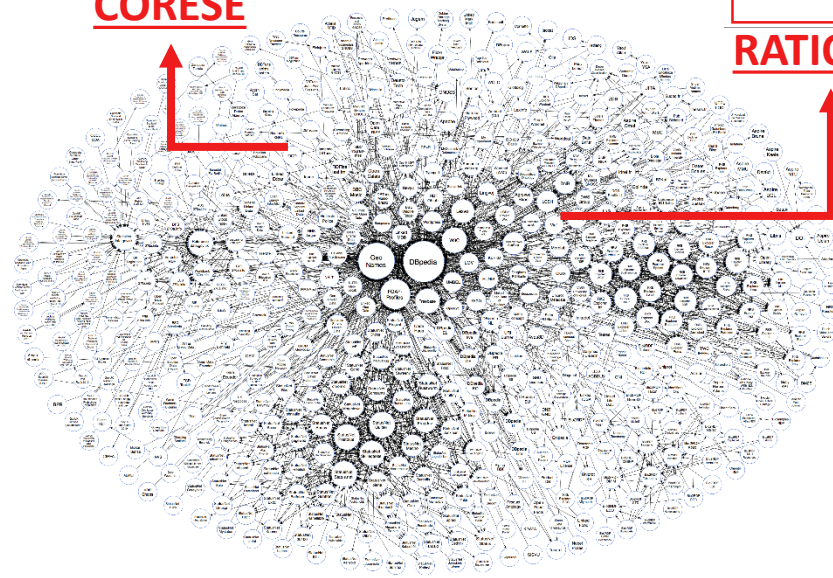
RATIO4TA



predict & explain



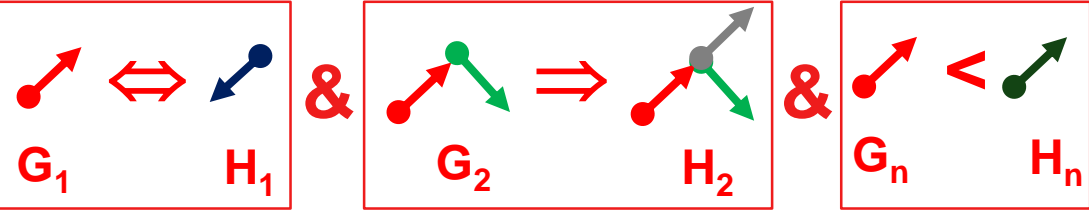
[Hasan et al.]



[Corby, Faron-Zucker et al.]

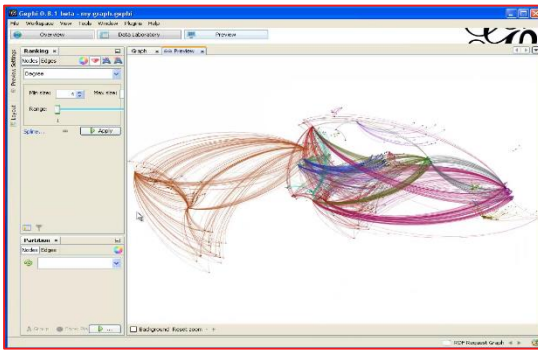
# QUERY & INFER

- graph rules and queries
- deontic reasoning
- induction

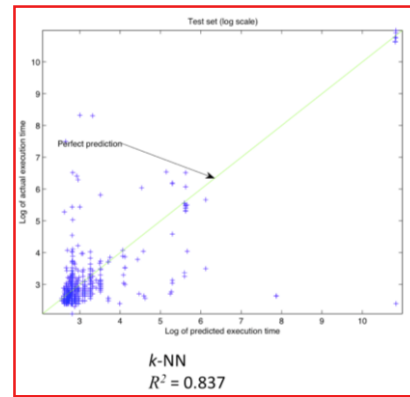


abstract graph machine  
STTL

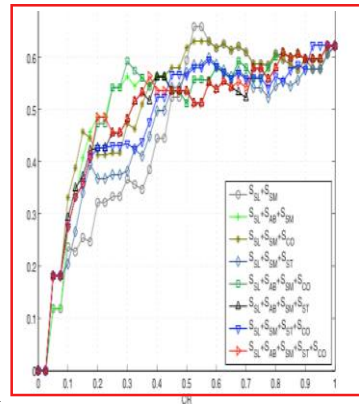
[Corby, Faron-Zucker et al.]



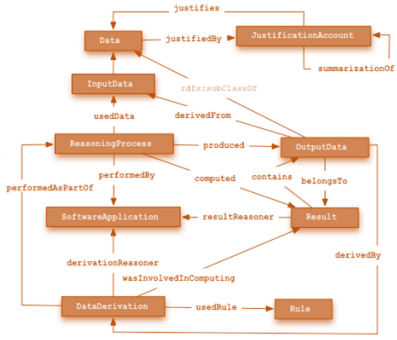
CORESE



RATIO4TA



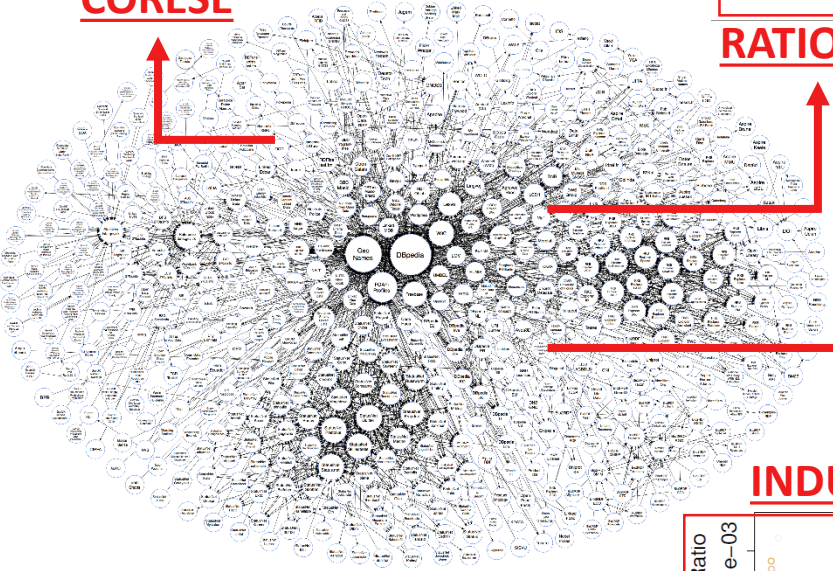
[Hasan et al.]



predict & explain

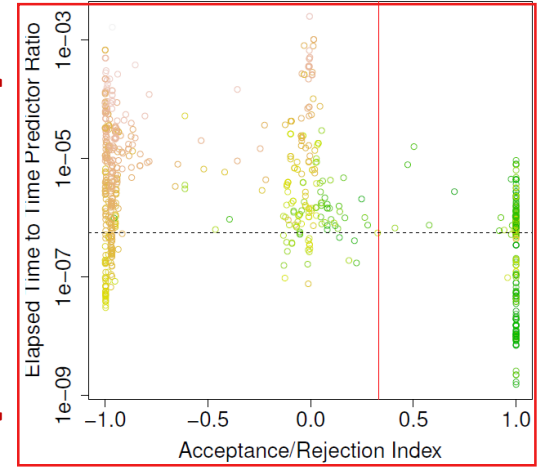
# QUERY & INFER

- graph rules and queries
- deontic reasoning
- induction



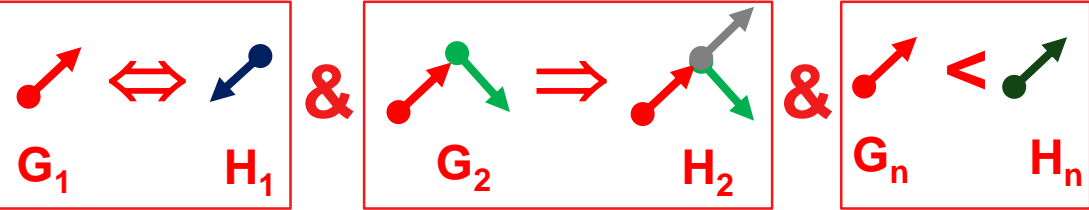
INDUCTION

[Tettamanzi et al.]



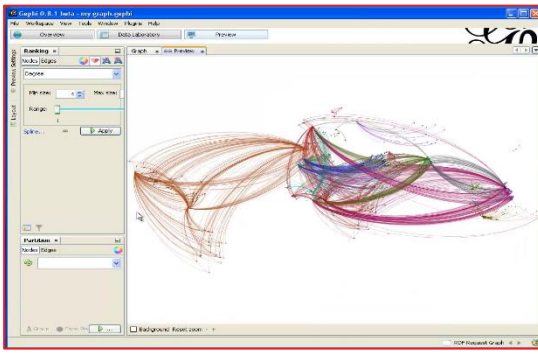
find missing knowledge

$$\phi = \text{SubClassOf}(\text{dbo:LaunchPad} \text{ dbo:Infrastructure})$$

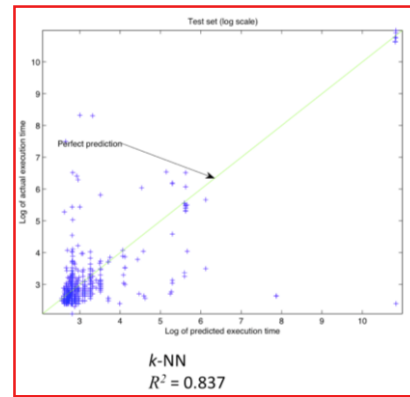


abstract graph machine  
STTL

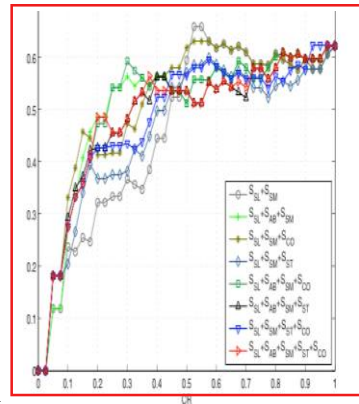
[Corby, Faron-Zucker et al.]



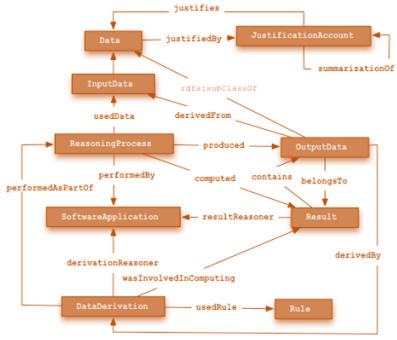
CORESE



RATIO4TA



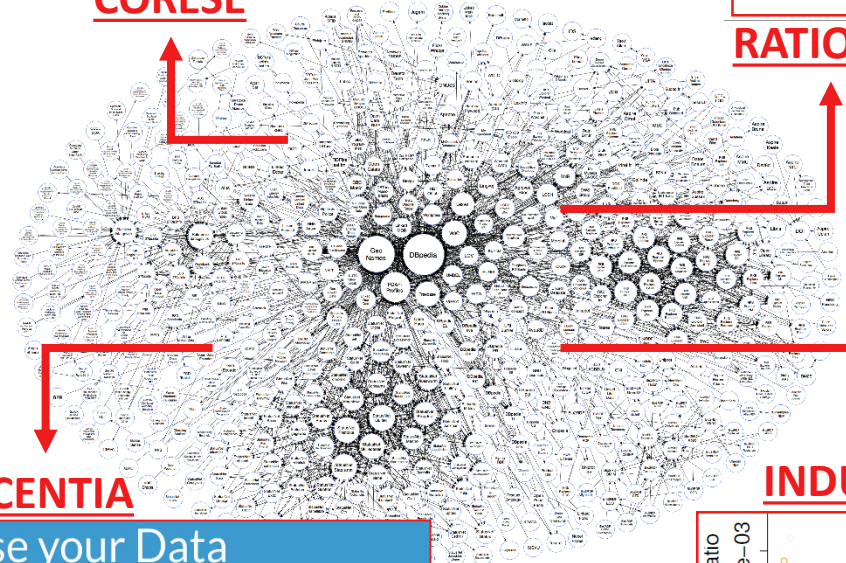
[Hasan et al.]



predict & explain

# QUERY & INFER

- graph rules and queries
- deontic reasoning
- induction



LICENTIA

INDUCTION

**License your Data**

Licentia is a suite of services to support you in looking for a suitable license for your data. Select the service you need from the list below!

Find a license for your Data	Check if a license is compatible with your needs	Visualize & download licenses
🔍	✓	📄

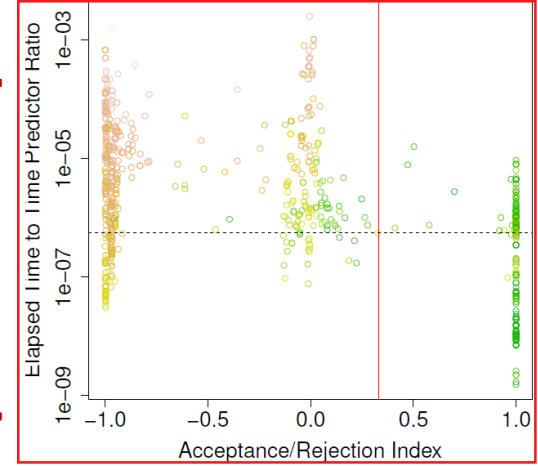
license compatibility and composition  
[Villata et al.]

$$L = \{l_1, l_2\}$$

$$R^{O^1} = \{r_1 : \Rightarrow_0^{l_1} Attribution, r_2 : \rightsquigarrow_0^{l_1} Commercial\}$$

$$R^{O^2} = \{r_3 : \Rightarrow_0^{l_2} \sim Commercial, r_4 : \Rightarrow_0^{l_2} ShareAlike, r_5 : \rightsquigarrow_0^{l_2} Derivative\}$$

[Tettamanzi et al.]



find missing knowledge

$\phi = \text{SubClassOf}(\text{dbo:LaunchPad } \text{dbo:Infrastructure})$





DÉCOUVRIR, APPRENDRE ET RÉUSSIR

QU'EST-CE QUE FUN ?

ACTUALITÉS

LES COURS

LES ÉTABLISSEMENTS

SE DÉCONNECTER

## Web sémantique et Web de données

[Gandon, Corby, Faron-Zucker]



### présentation

#### A PROPOS DU COURS

Ce cours vous propose de vous former aux standards du Web de données et du Web sémantique. Il vous présentera les langages qui permettent :

- de représenter et de publier des données liées sur le Web (RDF) ;
- d'interroger et de sélectionner très précisément ces données à distance et au travers du Web (SPARQL) ;

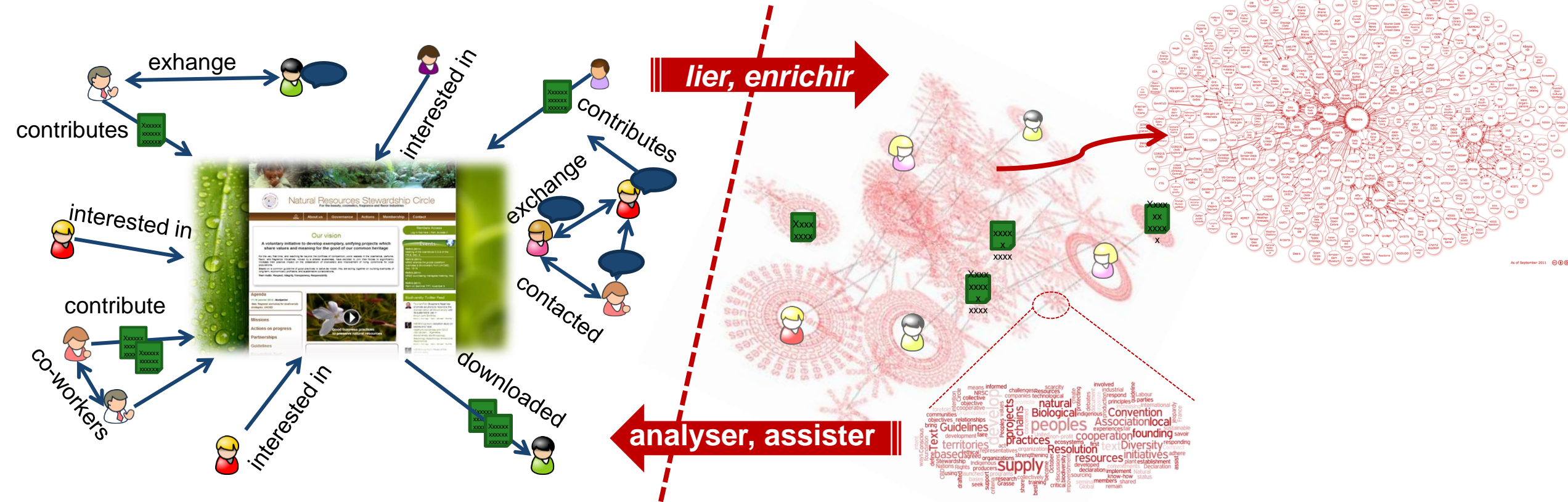
Voir la vidéo de présentation du cours



MOOC

# société coopérative spin-off wimmics

intégration aux SI, veille, intelligence, réseaux sociaux d'entreprise



he who controls metadata, controls the web  
and through the *world-wide* web many things in our world.



Fabien Gandon - @fabien\_gandon - <http://fabien.info>

Web-instrumented man-machine interactions, communities and semantics  
Technical details: <http://bit.ly/wimmics-papers>

