E-Envir 2019 Ecole thématique CNRS

Les portails d'accès aux ressources sémantiques

Ecole thématique E-Envir, Gif-sur-Yvette, Octobre 2019

Tutorial: “How to use ontology repositories and ontology–based services”

DATA FAIRness International Summer School

Lecce, July 3rd 2019

Tutorial presentation

Who am I?

Clement Jonquet

Associate Professor,
University of Montpellier,

PI of AgroPortal, SIFR &
D2KAB projects

- « Disclaimer »
  - Despite the availability of concrete platforms, this remains a research activity (in progress)
  - Excuse bugs, inconsistencies, misunderstanding, limits
  - We will not have an answer to everything

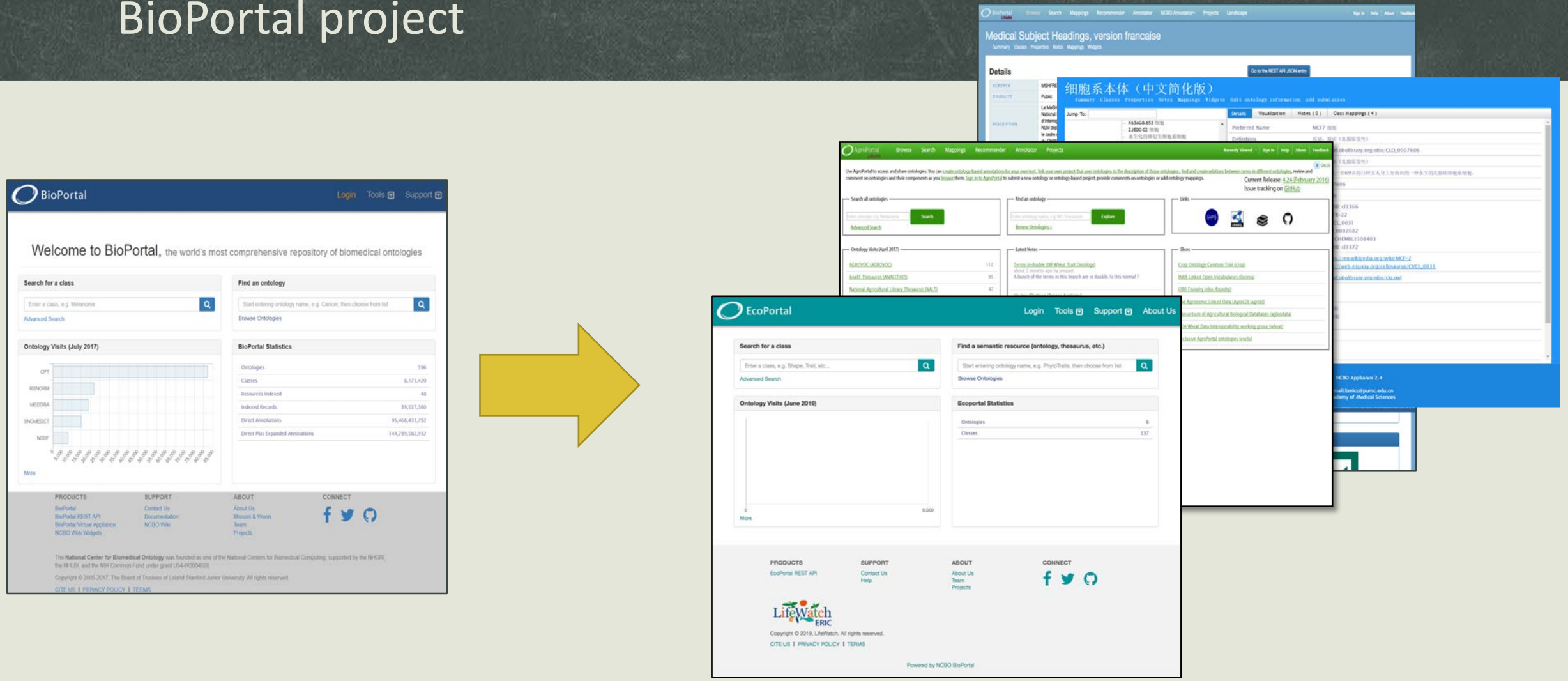
With support of:

- ANR D2KAB
- H2020 SIFRm

Tutorial objectives

- Work with Bio/Agro/EcoPortal platform
- Describe your ontology using standard vocabularies
- Interconnect your ontology to the rest of the world
- Annotate text with ontologies
- Manipulate APIs (REST or SPARQL) to automate tasks

Ontology repository technology developed for the NCBO BioPortal project



Tutorial plan

Ontology selection

metadata
search
recommender

Drop & use an ontology

browsing
visualization
API

Semantic annotation of text

annotator

Ontology alignments management

create
retrieve
API

Automatize access with API

REST
SPARQL

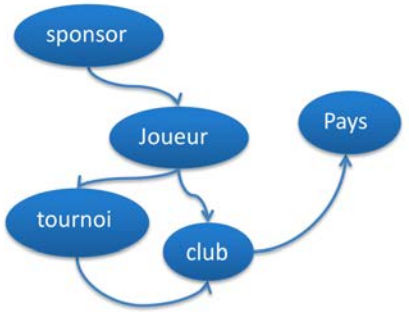
Who are you?

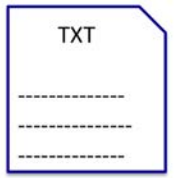
- Have you ever used ontologies (or terminologies in general)? BioPortal?
  - For which task?
  - Much interested in your feedback
- Your background?
- Why are you here today?
  - Super quickly
- Check: Access to slides?

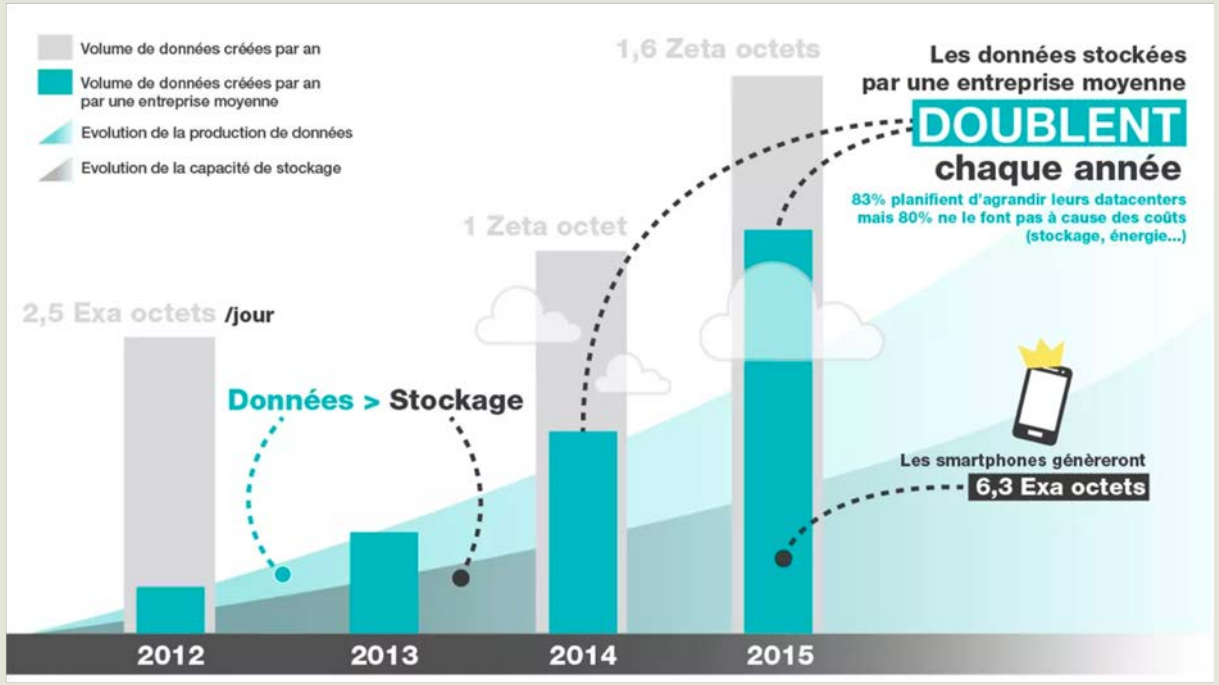
General introduction

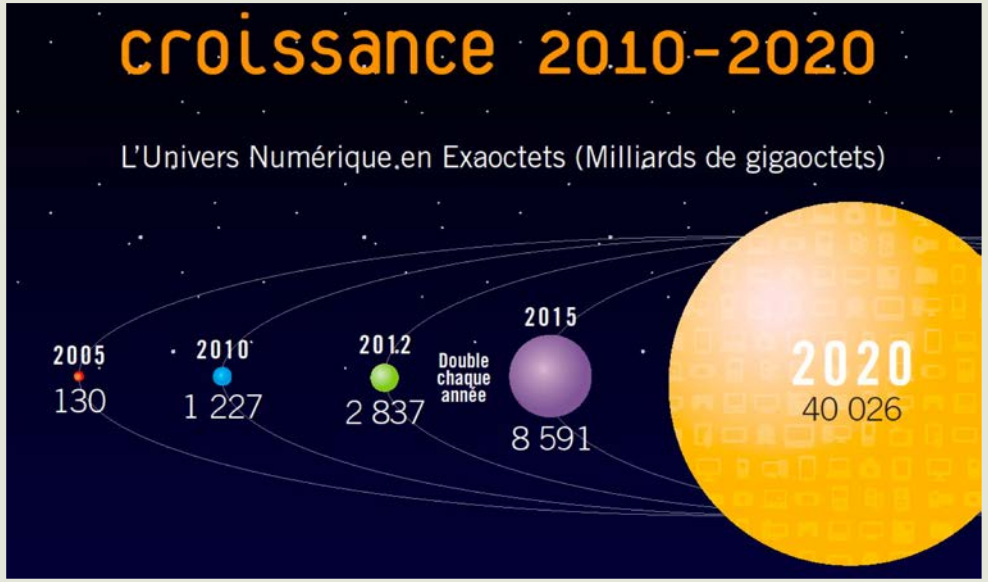
Data explosion

N°SECU	NOM	VILLE
1234567890123	MARTIN	NICE
2345678901234	SIMON	LYON
1357924680123	BERNARD	PARIS





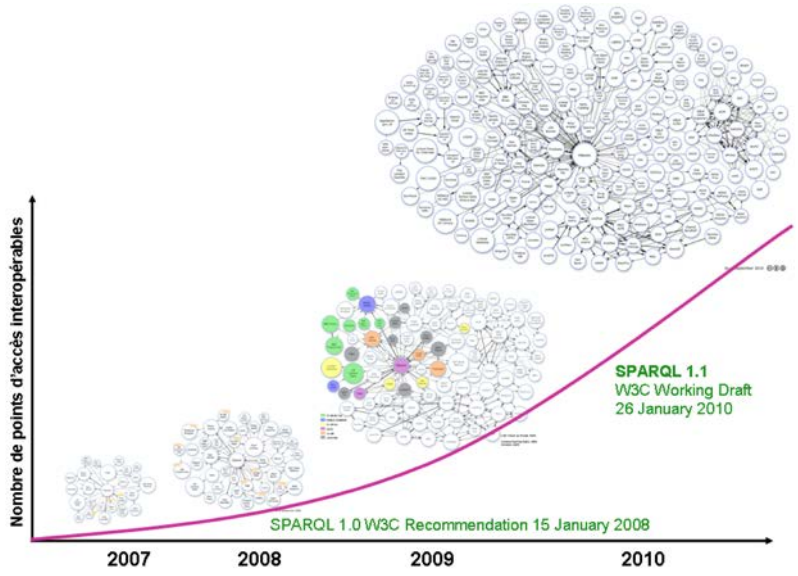


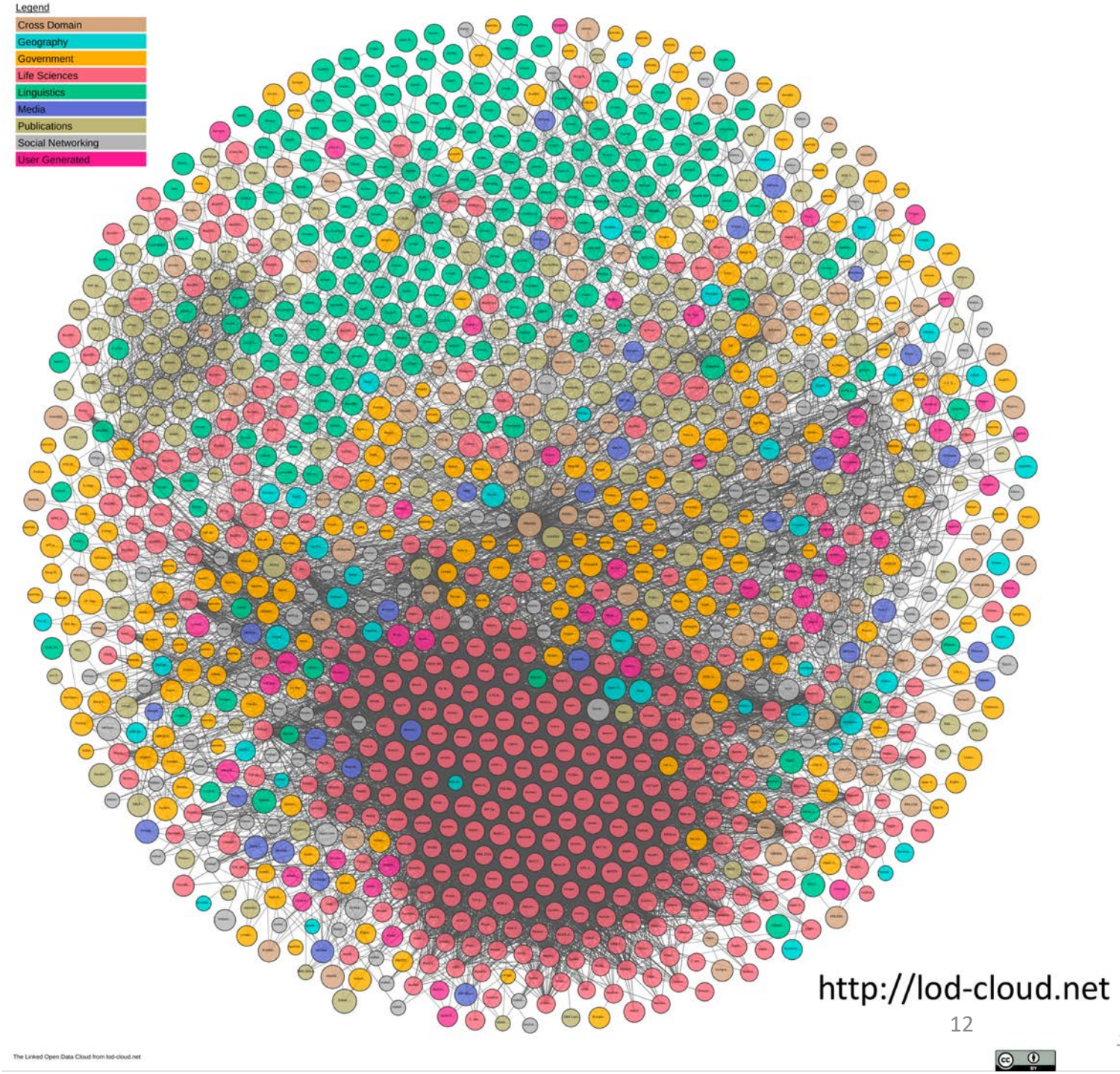


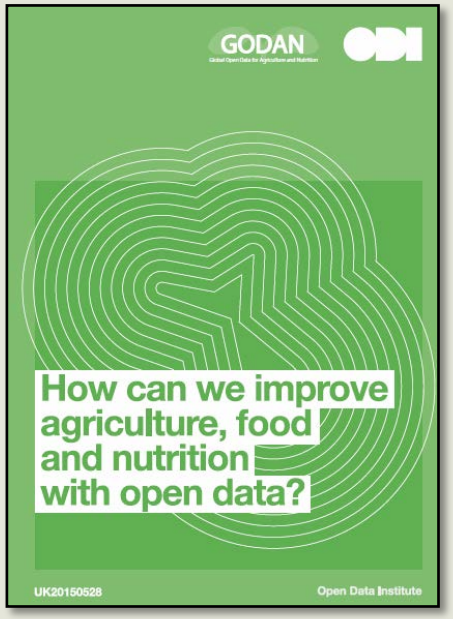
Big
Open
Linked

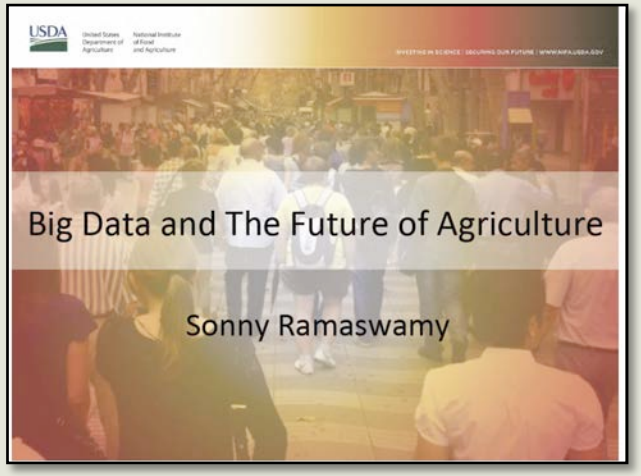
Our job is to structure these data

Linked Open Data create a « Web of data »

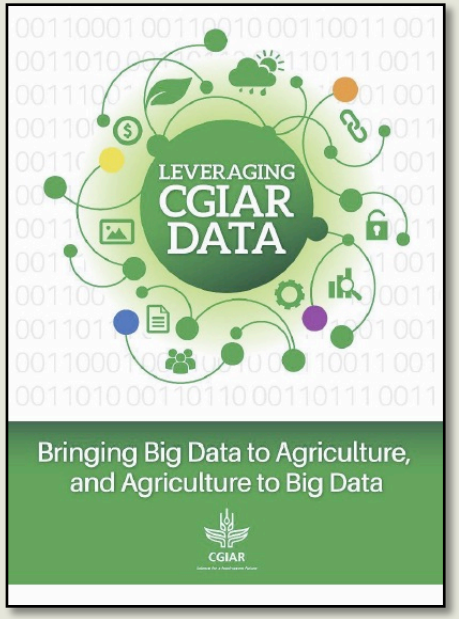


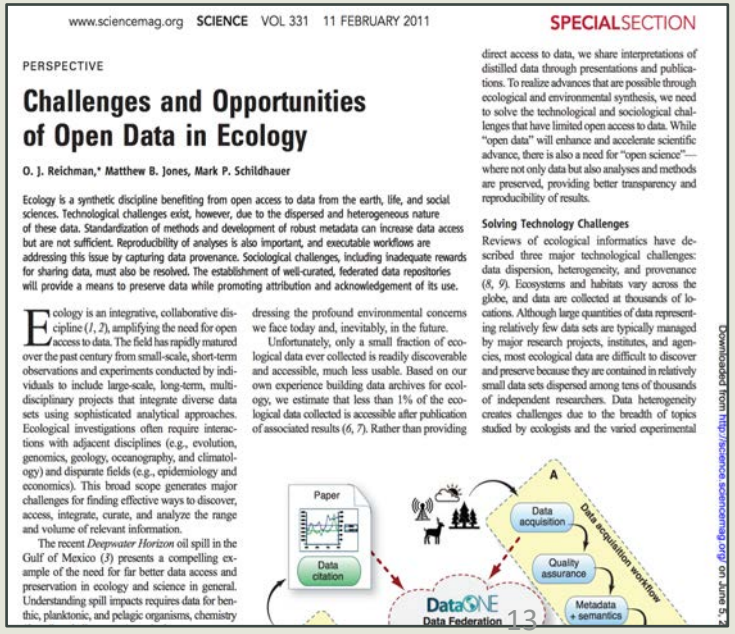






Big and open data is also happening in agriculture and biodiversity

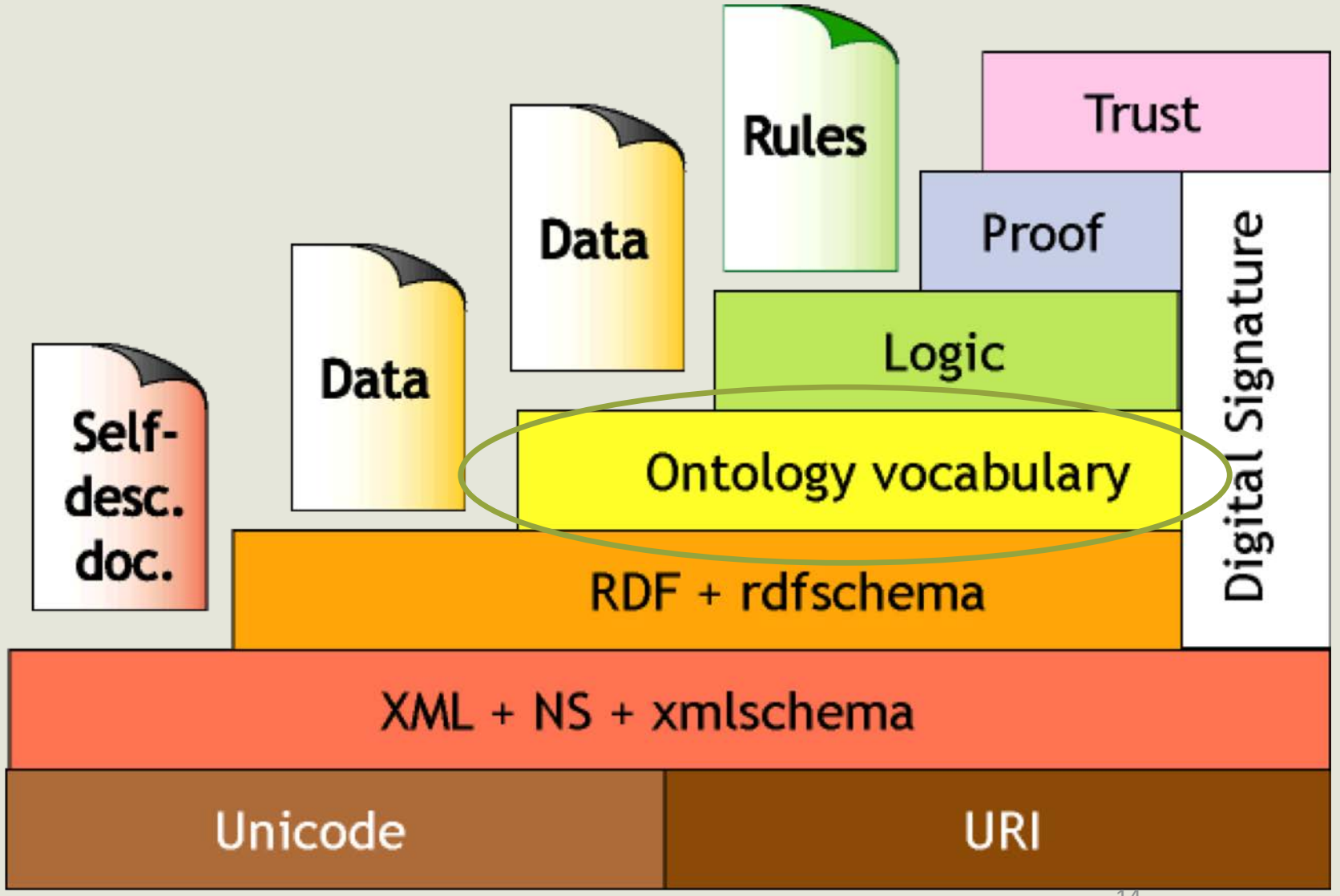




The Semantic Web offers the technologies

The FAIR principles have established the importance of using standards vocabularies or ontologies to describe FAIR data and to facilitate interoperability and reuse:

I2. (meta)data use vocabularies that follow FAIR principles



URL → URI → IRI

identify what
exists on the web.

http://my-site.fr

identify,
on the web,
what exists.

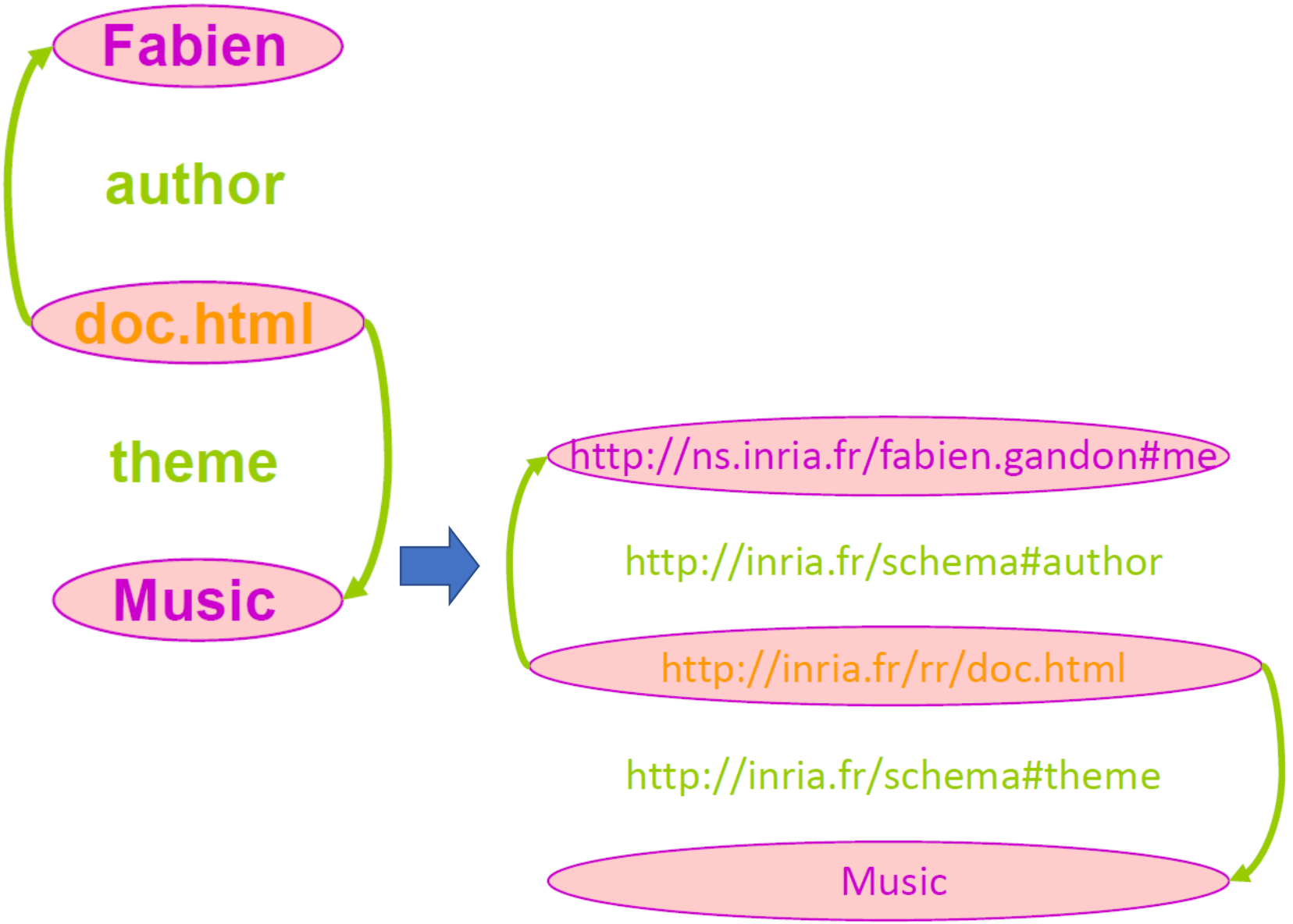
http://animals.org/zebra#this

identify,
on the web,
in any language,
what exists.

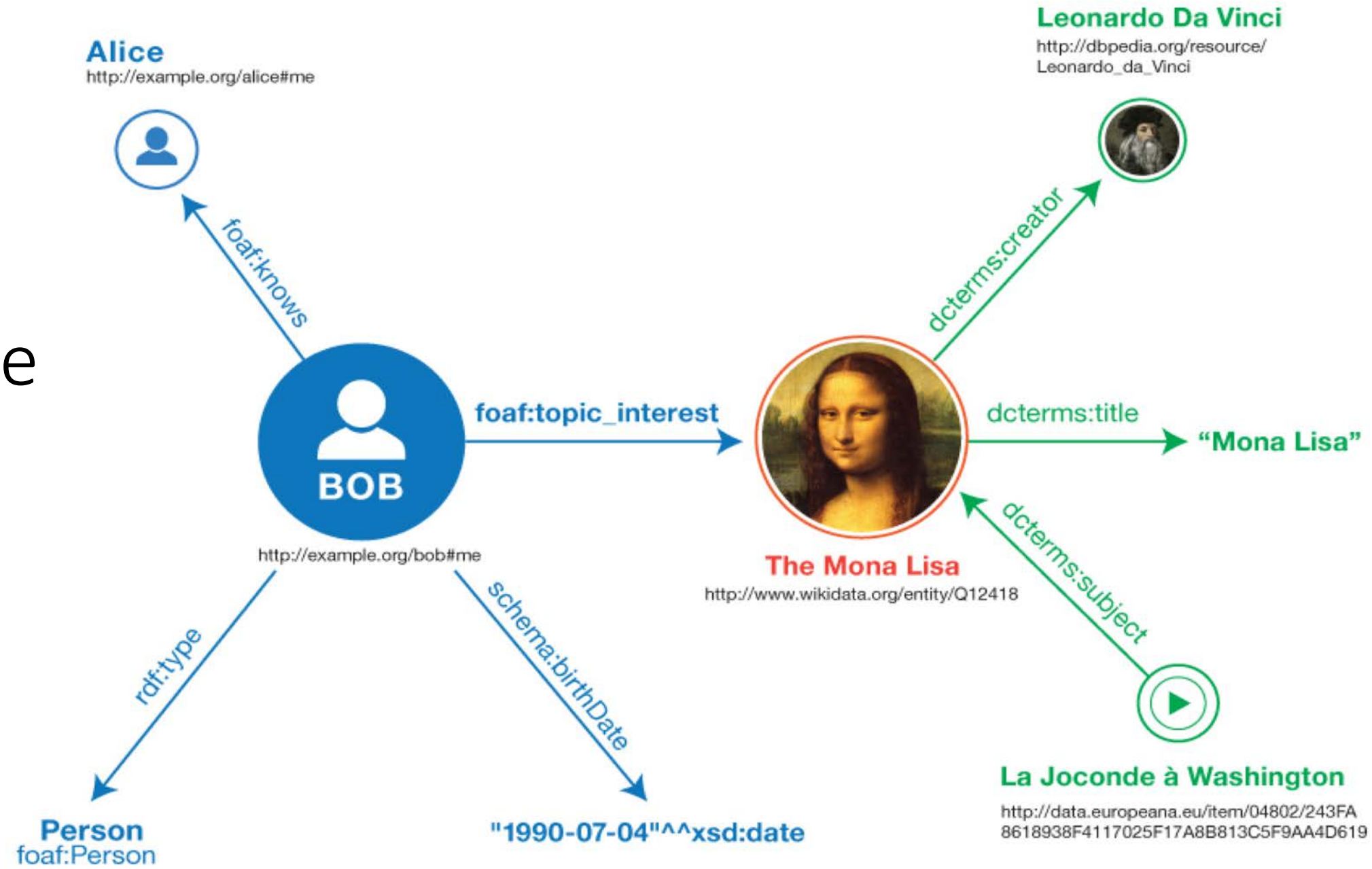
http://الحيوانات.tn/斑馬#this

Credit: F. Gandon (Inria)

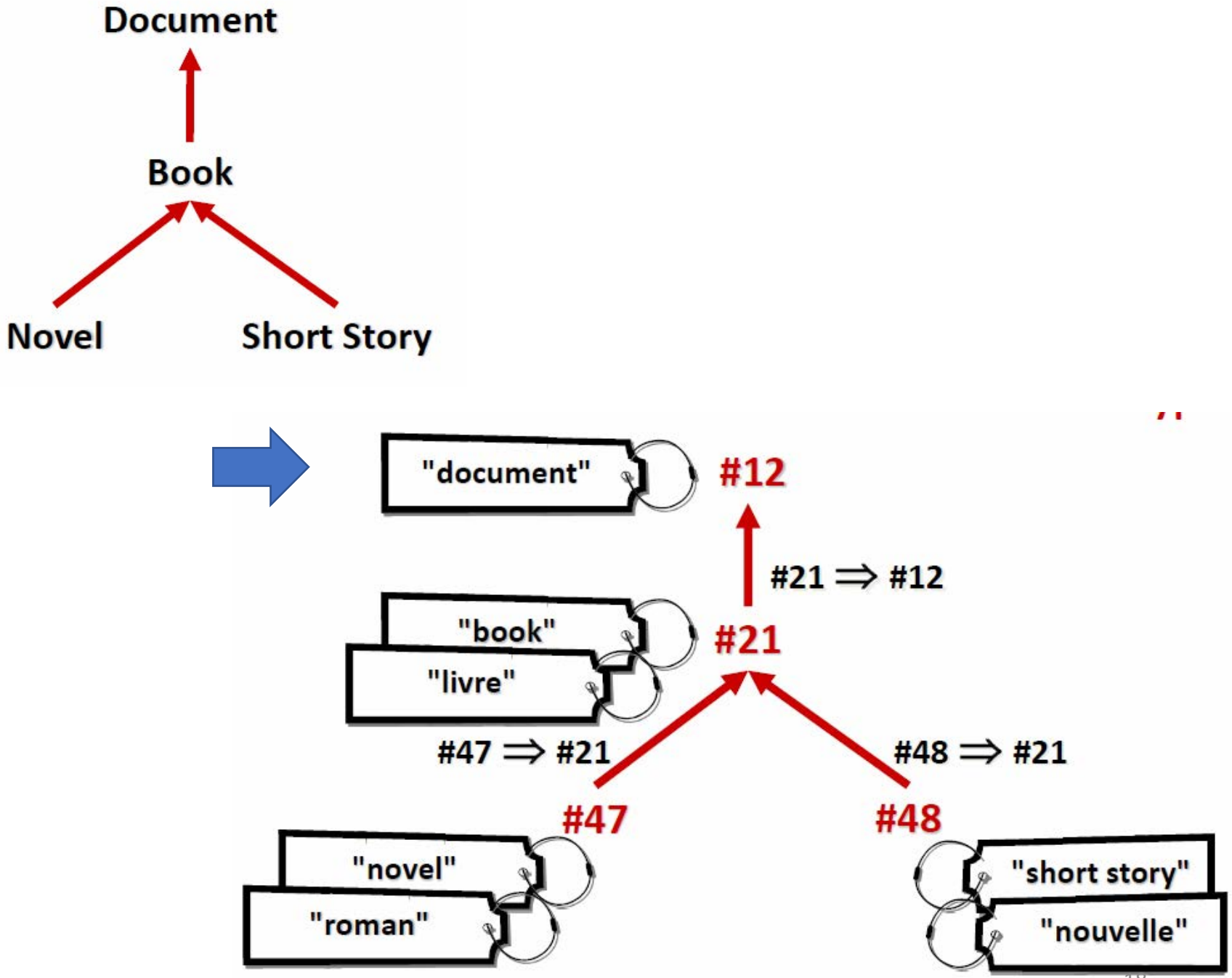
The Semantic Web relies on RDF



Knowledge graphs

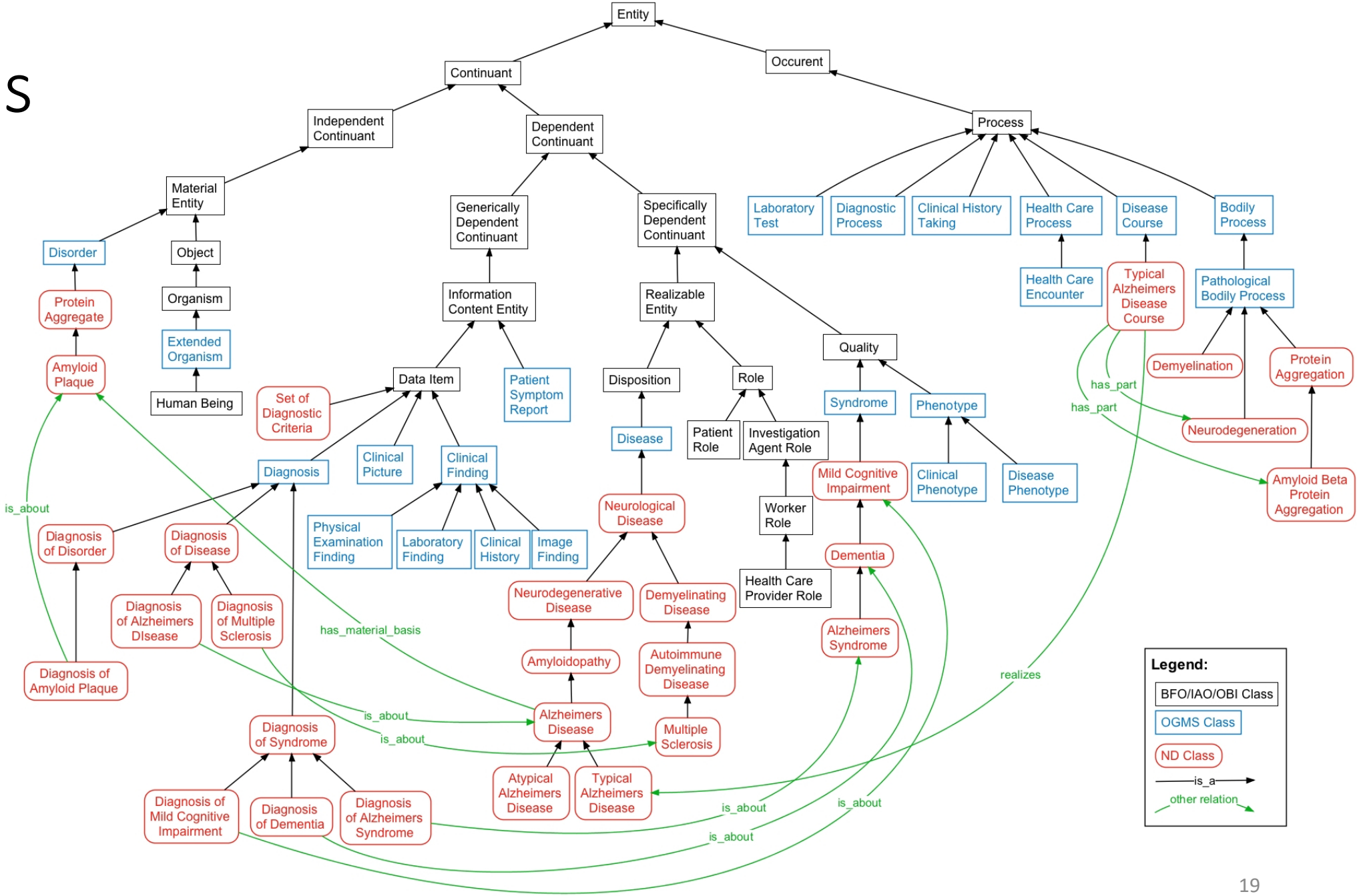


Ontologies (small)



Credit: F. Gandon (Inria)

Ontologies (big)



Describe data

AgroPortal LIRMM | Browse | Search | Mappings | Recommender | Annotator | Projects | Landscape | Recently Viewed | Sign In | Help | About | Feedbac

Sustainable Development Goals Interface Ontology

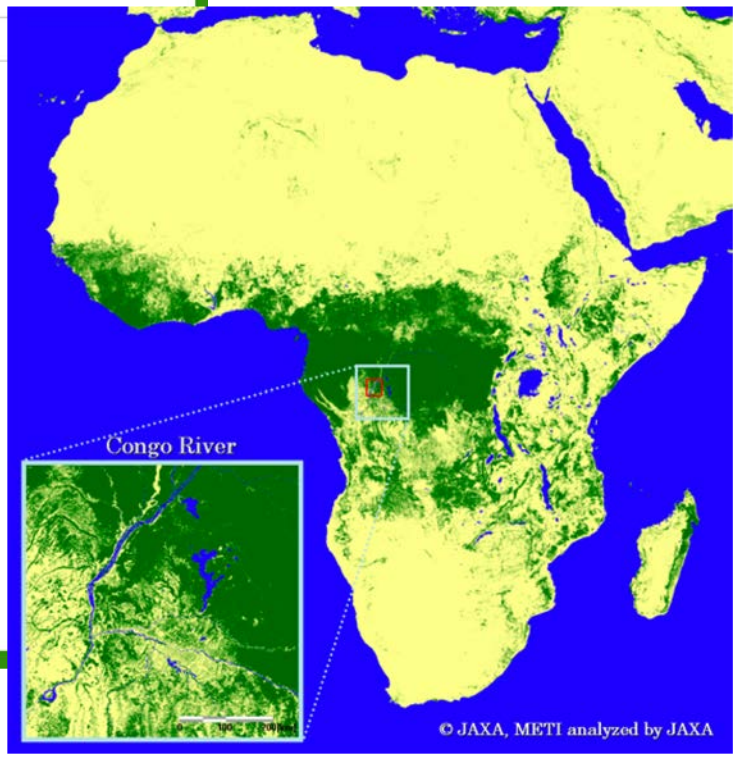
Summary Classes Properties Notes Mappings Widgets

Jump To:

- entity
  - continuant
    - generically dependent continuant
      - information content entity
        - conclusion based on data
        - data item
          - data about an ontology part
          - data set
          - direct material input
          - energy intensity
          - material footprint
          - material footprint per capita
          - material input per capita
          - material intensity
          - material trade balance
          - material trade balance per capita
          - measurement datum
          - net permanent forest loss
          - resource consumption
          - sustainable development goal indicator value
            - Agricultural export subsidies
            - Aid for Trade commitments and disbursements
            - Amount of water- and sanitation-related official developr
            - Average marine acidity (pH) measured at agreed suite of
            - Change in the extent of water-related ecosystems over ti
            - Change in water-use efficiency over time
            - CO2 emission per unit of value added
            - Coverage by protected areas of important sites for mount
            - Death rate due to road traffic injuries
            - Debt service as a proportion of exports of goods and servi
            - Developing countries' and least developed countries' shar
            - Dollar value of financial and technical assistance (includir
            - Extent of use of country-owned results frameworks and pl
            - Extent to which (i) global citizenship education and (ii) ec
            - Financial Soundness Indicators
            - **Forest area as a proportion of total land area**
            - Global food loss index

Details | Visualization | Notes (0) | Class Mappings (0) | Access Class JSON

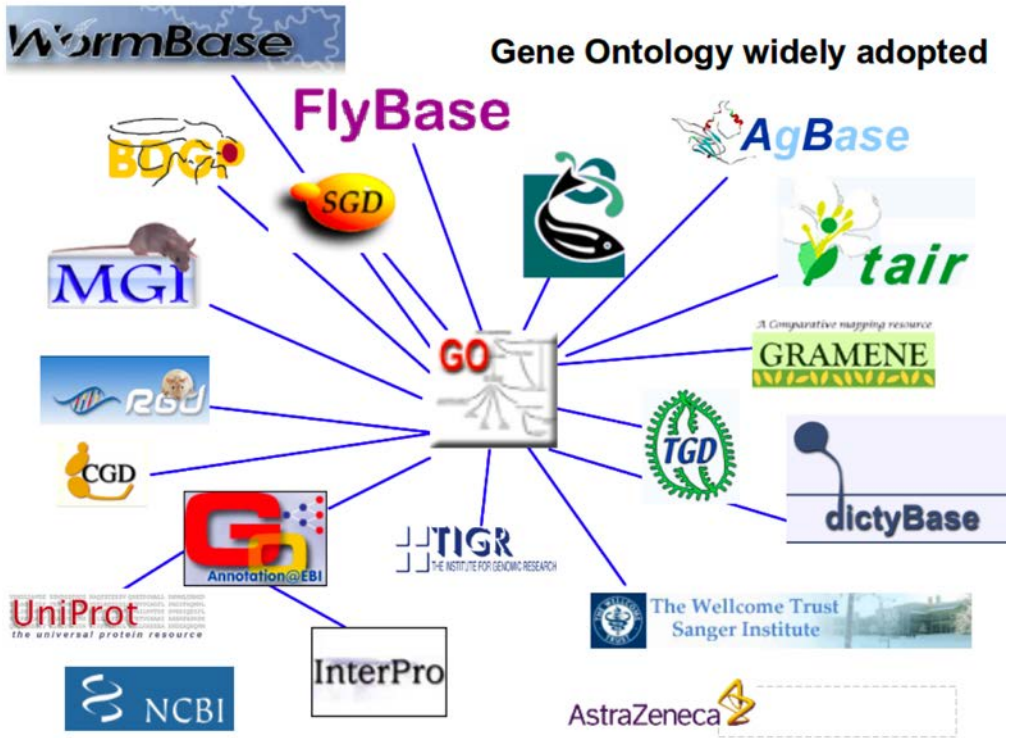
Preferred Name	Forest area as a proportion of total land area
ID	http://purl.unep.org/sdg/SDGIO_00020174
label	Forest area as a proportion of total land area
prefixIRI	sdg:SDGIO_00020174
prefLabel	Forest area as a proportion of total land area
UN SDG Indicator ID	15.1.1
UNSD SDG indicator code	C150101
subClassOf	sustainable development goal indicator value



AgroPortal LIRMM | LabEx NUMEV | IBC Institut de biologie computationnelle | agropolis fondation

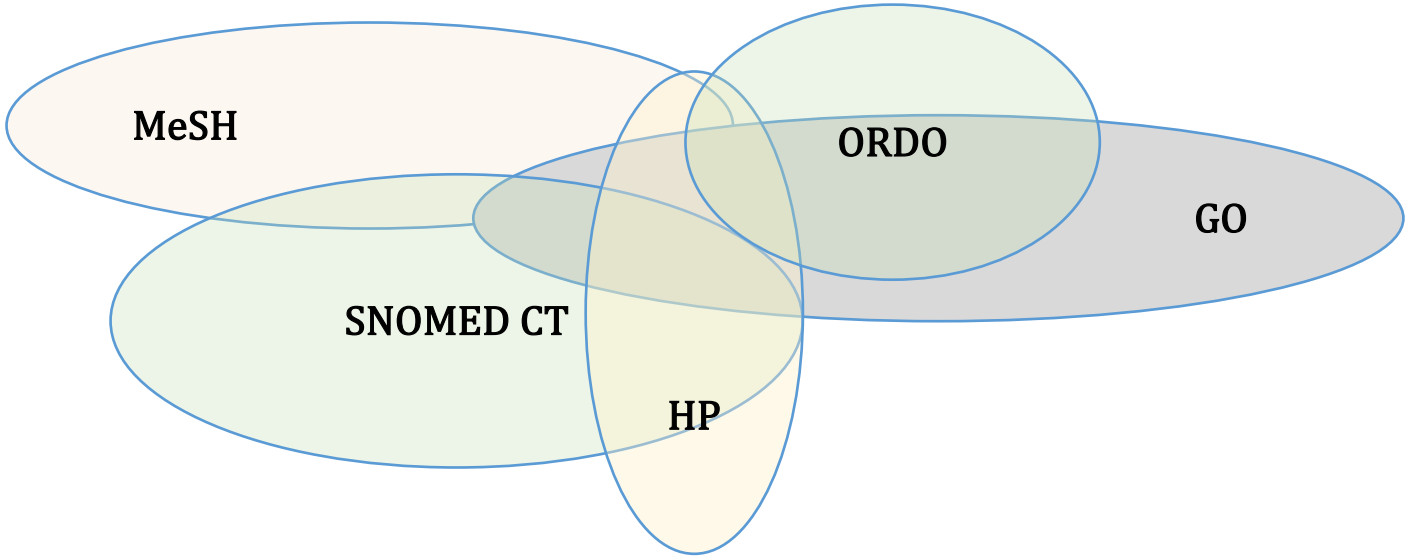
Why ontologies are important in science?

- To provide canonical representation and sharing of scientific knowledge
- To annotate experimental data to enable interpretation, comparison, and discovery across databases
- To facilitate knowledge-based applications for
  - Decision support, reasoning
  - Natural language-processing
  - Data integration

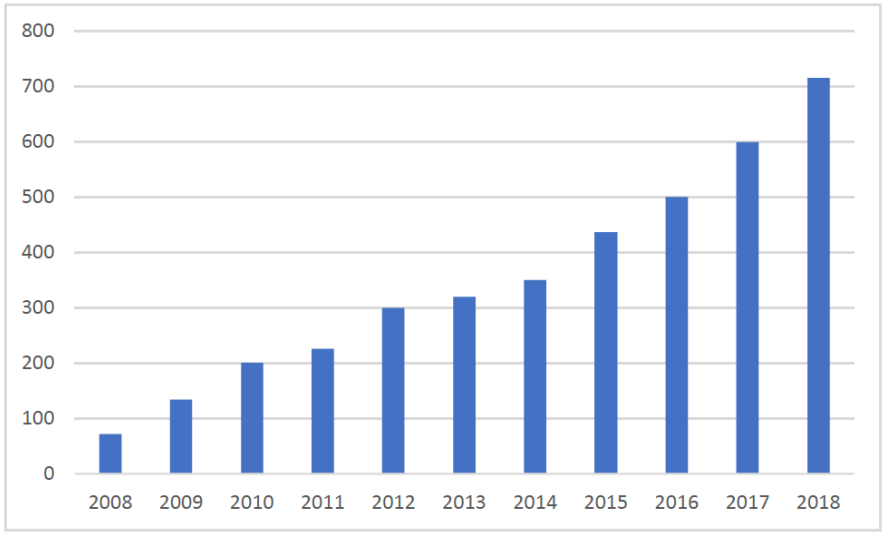


- But ontologies are: spread out, in different formats, of different size, with different structures

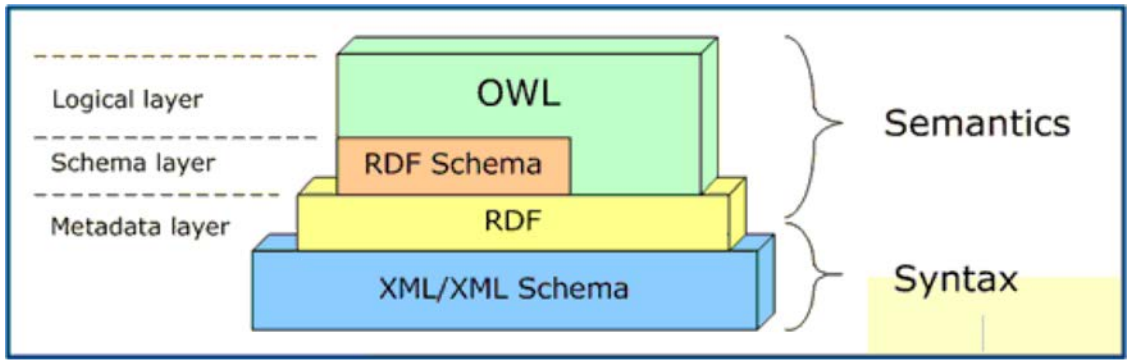
Other issues with ontologies



Overlapping ontologies



Number of ontologies in the NCBO BioPortal



Variety of representation languages

Ontology libraries, registries, repositories

- Ontology libraries defined as
  - *"a library system that offers various functions for managing, adapting and standardizing groups of ontologies. It should fulfill the needs for re-use of ontologies. In this sense, an ontology library system should be easily accessible and offer efficient support for re-using existing relevant ontologies and standardizing them based on upper-level ontologies and ontology representation languages."* [Ding & Fensel, 2001]

Ontology repositories… a subject of study

- Defined by [Hartmann, Palma, Gomez-Perez, 2009] as:
  - *"a structured collection of ontologies (…) by using an Ontology Metadata Vocabulary. References and relations between ontologies and their modules build the semantic model of an ontology repository. Access to resources is realized through semantically-enabled interfaces applicable for humans and machines. Therefore a repository provides a formal query language"*

- Open Ontology Repository initiative (late 2000s)
- 2010 ORES workshop
- Review of ontology repositories
  - [*Where to publish and find ontologies?* D'Aquin & Noy, 2012]

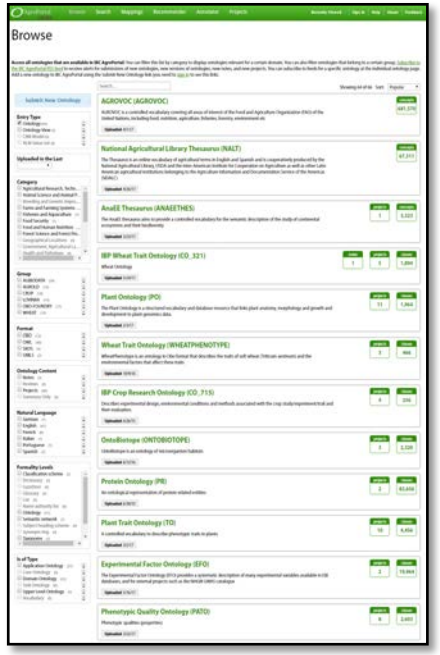
- New platform in 2015 Aber-OWL
- OLS 3.0, AgroPortal release

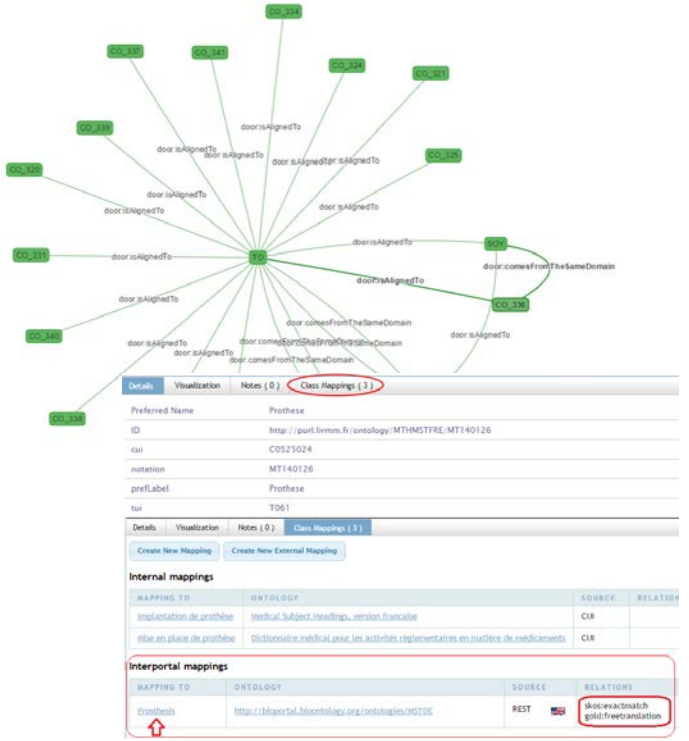
Why ontology repositories are important?

- You've built an ontology, how do you let the world know?
- You need an ontology, where do you go to get it?
- How do you know whether an ontology is any good?
- How do you find data resources that are relevant to the domain of the ontology?
- How could you leverage your ontology to enable new science?
- How could you use ontologies without managing them ?

Ontology repositories help to make ontologies FAIR

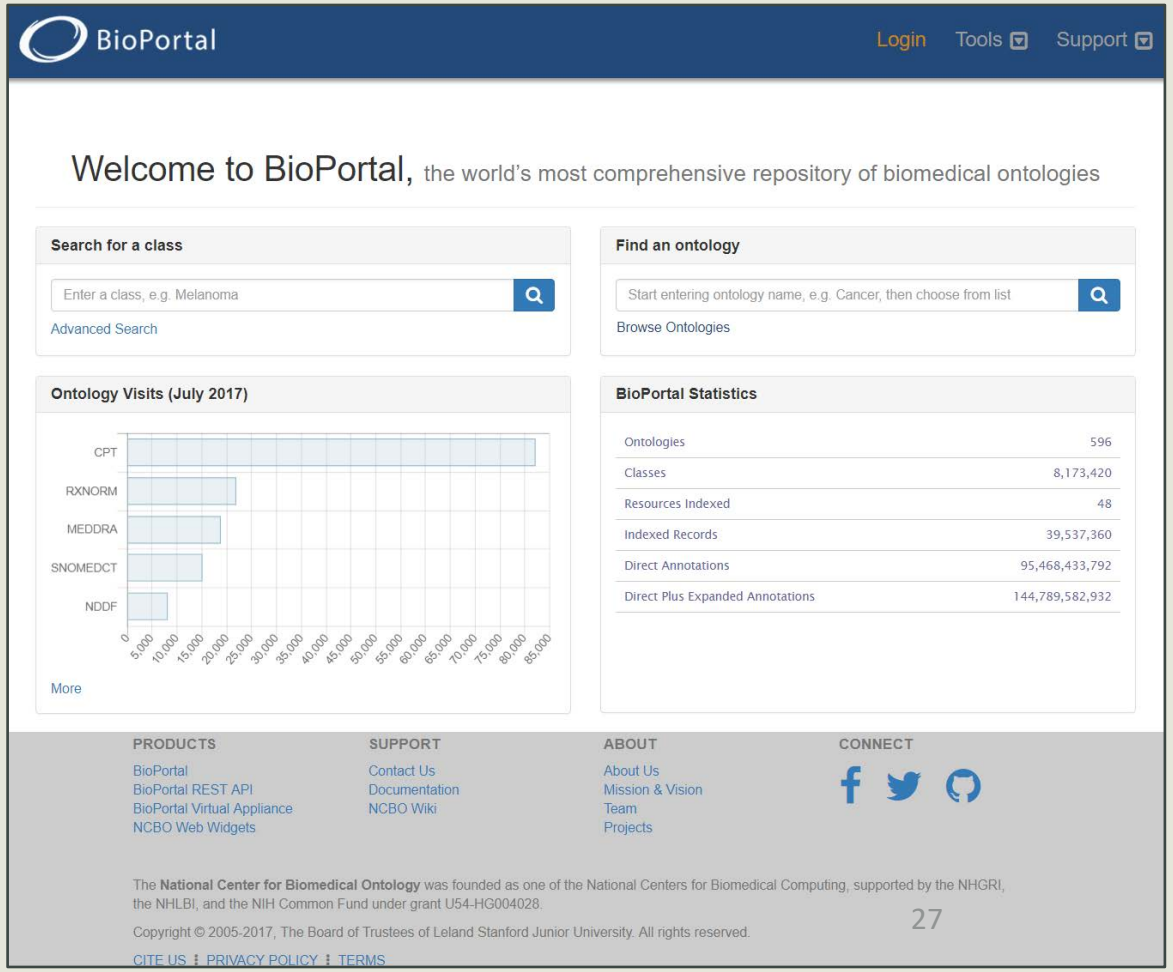
Findable **A**ccessible **I**nteroperable **R**e-usable





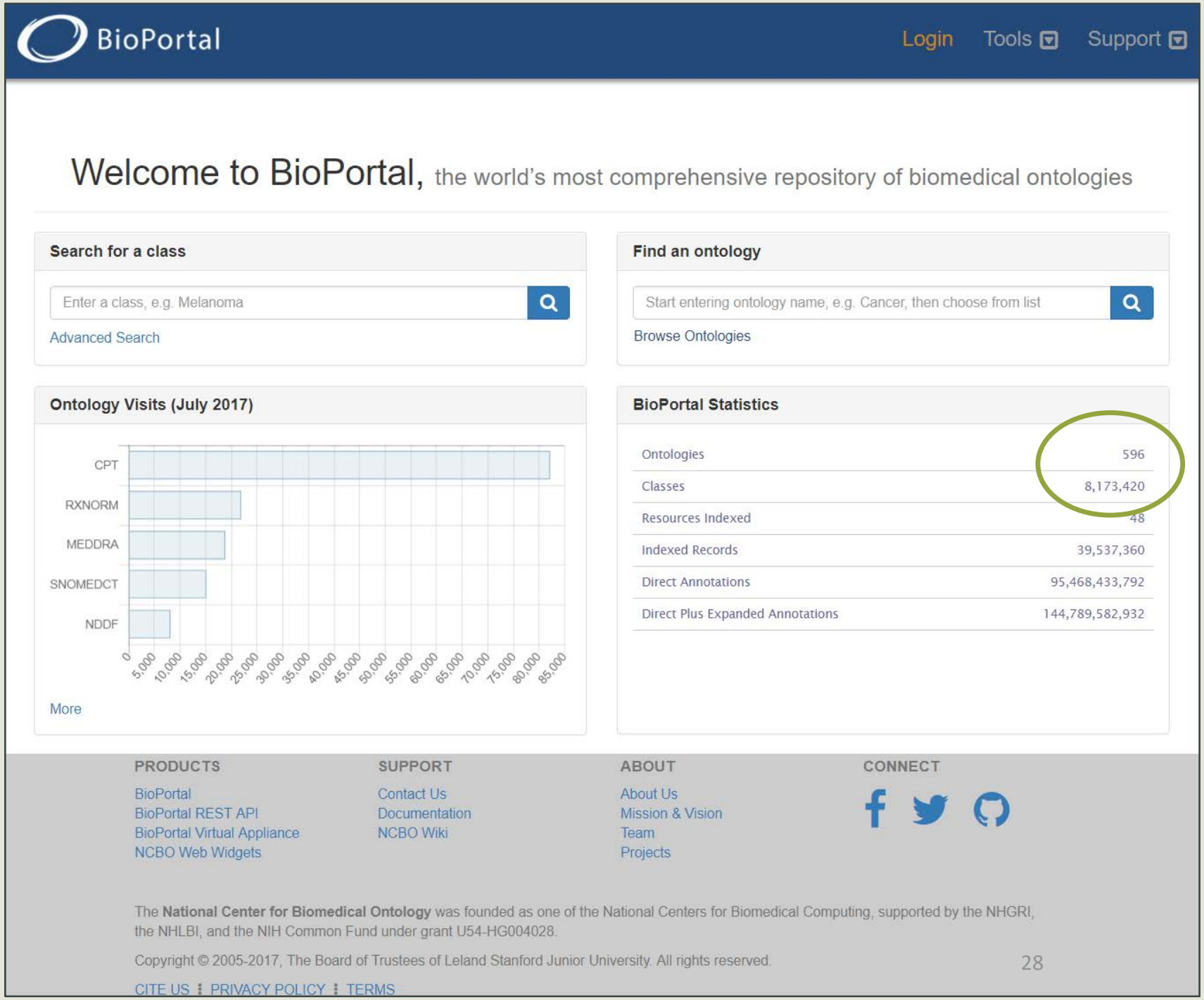
Focus on NCBO BioPortal : a “one stop shop” for biomedical ontologies

- Web repository for biomedical ontologies
  - Make ontologies accessible and usable – abstraction on format, locations, structure, etc.
  - Users can publish, download, browse, search, comment, align ontologies and use them for annotations both online and via a web services API.



- Online support for ontology
  - Peer review & notes
  - Versioning
  - Mapping
  - Search
  - Resources
  - Annotation

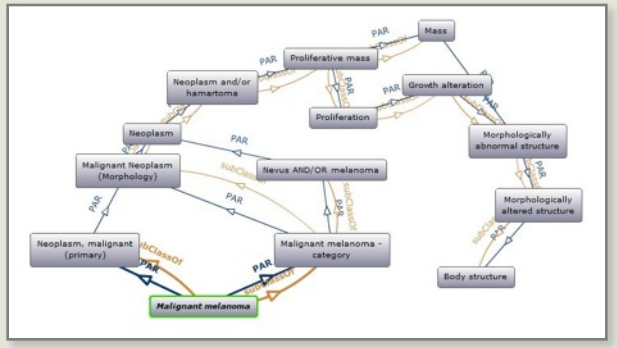
- Open source technology
  - Packaged in a “virtual appliance”
  - Set up your own “bioportal” in a few days



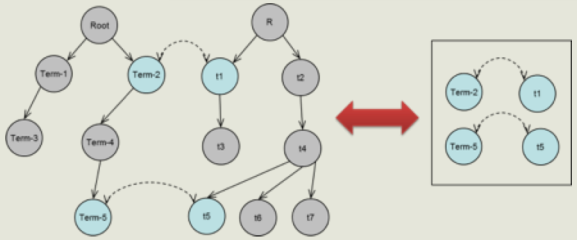
Noy, N. F., Shah, N. H., Whetzel, P. L., ..., Jonquet C., ... & Musen, M. A. (2009). BioPortal: ontologies and integrated data resources at the click of a mouse. *Nucleic acids research*, 37(suppl_2), W170-W173. **+800 citations.**

http://data.bioontology.org

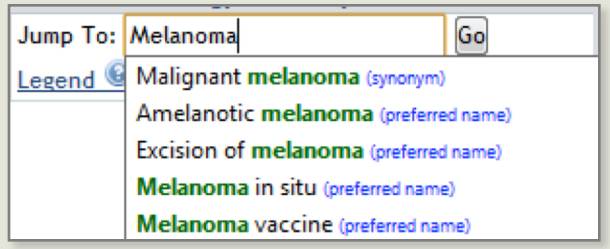
Ontology Services
- Search
- Traverse
- Comment
- Download



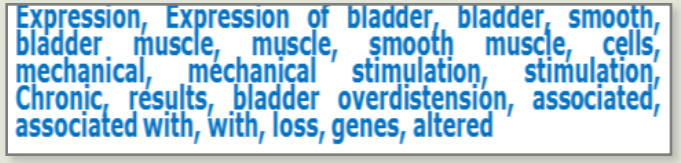
Mapping Services
- Create
- Upload
- Download



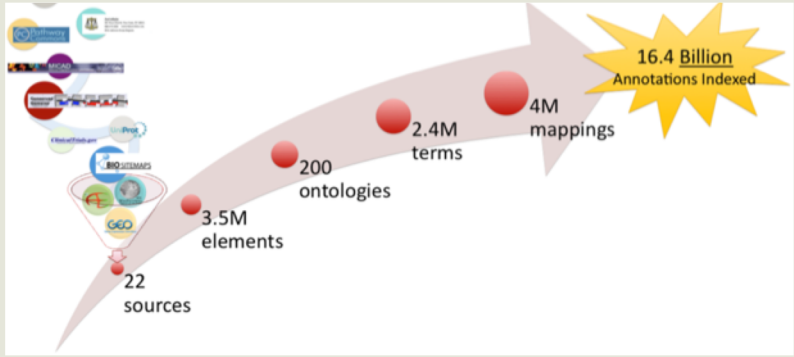
Widgets
- Tree-view
- Auto-complete
- Graph-view



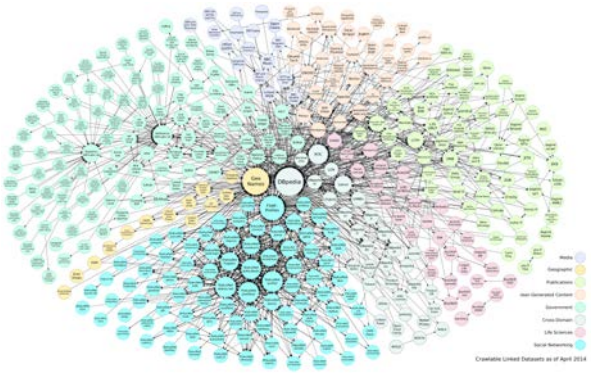
Annotation → Term recognition

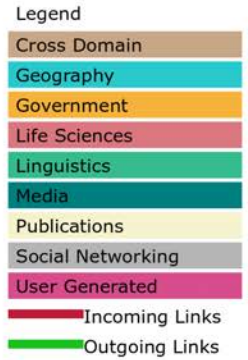


Data Access → Search "data" annotated with a given term



http://bioportal.bioontology.org





NCBO BioPortal data as of 2013

http://lod-cloud.net

Who has been reusing NCBO technology so far?

- NCI term browser (BioPortal first, then LexEVS) (https://nciterms.nci.nih.gov)
- Open Ontology Repository (OOR) Initiative (http://www.oor.net)
- Marine Metadata Interoperability Ontology Registry and Repository (http://mmisw.org)
- Earth Science Information Partners ESIPPortal (then ORR) http://semanticportal.esipfed.org
- AgroPortal http://agroportal.lirmm.fr
- SIFR/French BioPortal http://bioportal.lirmm.fr
- Stanford libraries https://biblio.ontoportal.org
- LifeWatch ERIC EcoPortal http://ecoportal.lifewatchitaly.eu/
- Chinese Academy of Medical Sciences http://medportal.bmicc.cn
- And a many hospitals, research labs, with private data and specific needs (often in-house annotation)

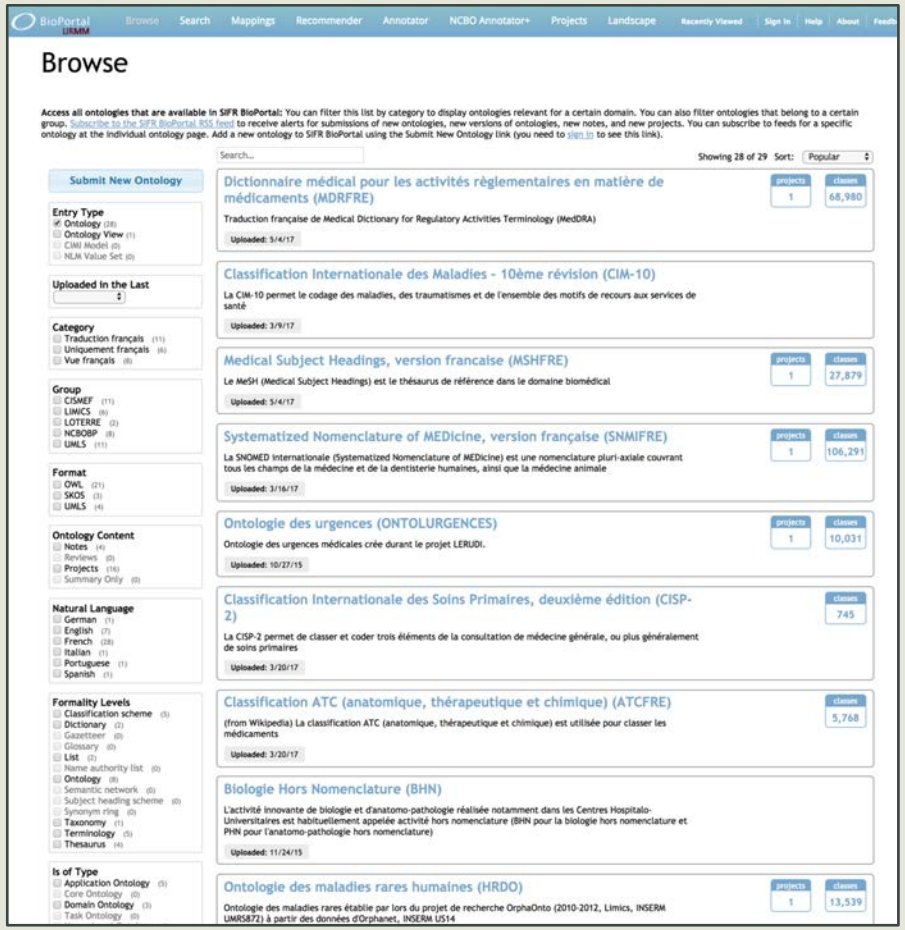
What are the ontology libraries out there?

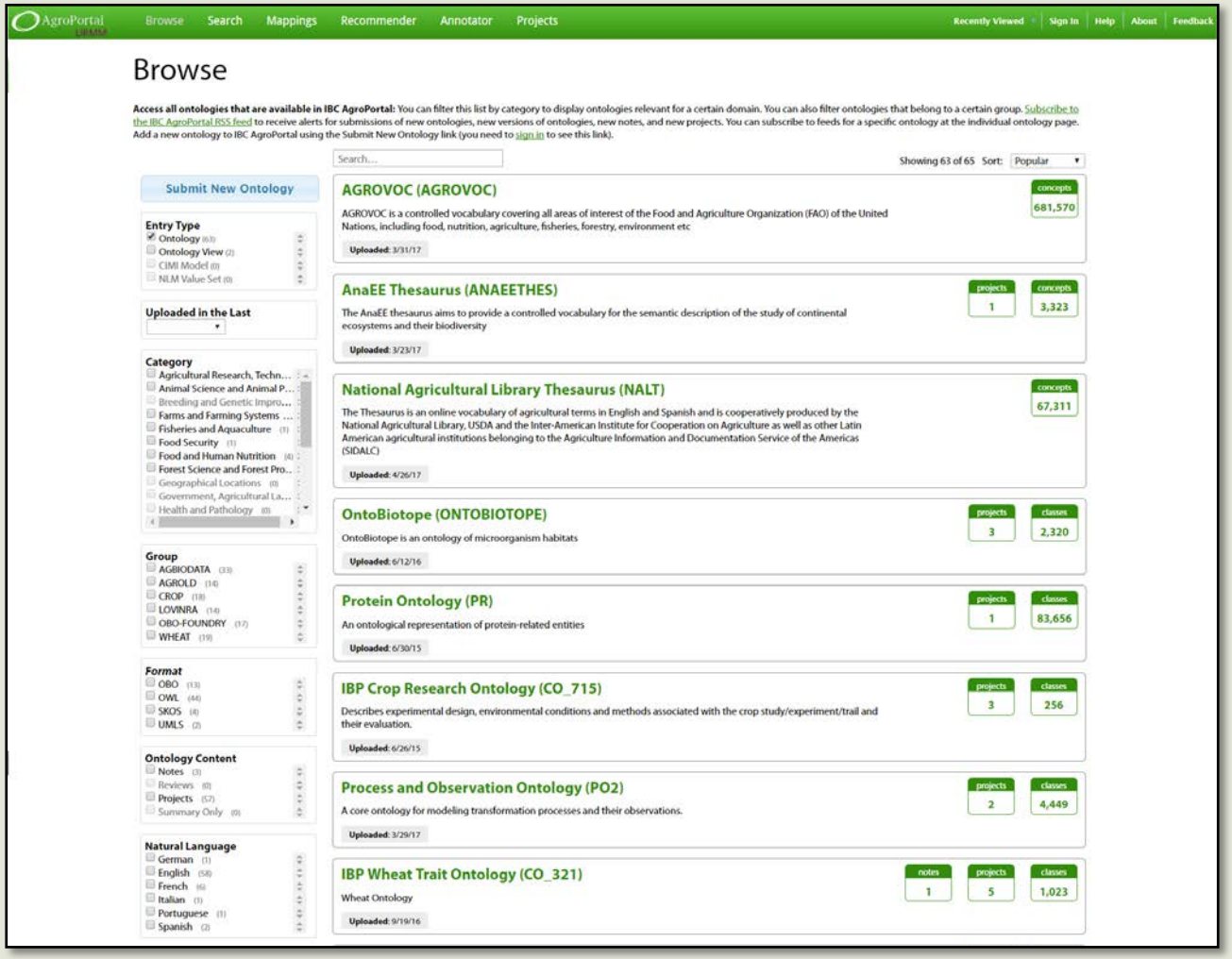
- Ontology repositories / portal
  - NCBO BioPortal
  - Ontobee
  - AberOWL
  - EBI Ontology Lookup Service
  - OKFN Linked Open Vocabularies
  - ONKI Ontology Library Service
  - MMI Ontology Registry and Repository
  - ESIPportal
  - AgroPortal
  - SIFR BioPortal
  - MedPortal
  - EcoPortal
  - CISMEF HeTOP
  - OntoHub
  - Ontoserver
- Web indexes
  - Watson, Swoogle, Sindice, Falcons

- Ontology libraries / listings (more or less updated)
  - OBO Foundry
  - WebProtégé
  - Romulus
  - DAML ontology library
  - Colore
  - FAO VEST Registry
  - FAIRsharing
  - DERI Vocabularies , OntologyDesignPatterns, Semanticweb.org, W3C Good ontologies
  - BARTOC
- Platform technology, Terminology Services
  - Mondeca ITM, LexEVS, ANDS, SKOSMOS, NERC-VS
- Abandoned projects
  - Cubboard, Knoodl, Schemapedia, SchemaWeb, OntoSelect, OntoSearch, TONES

28 ontologies/terminologies

- From the UMLS or CISMeF's HeTOP or uploaded by users
- Cleaned and checked for annotation





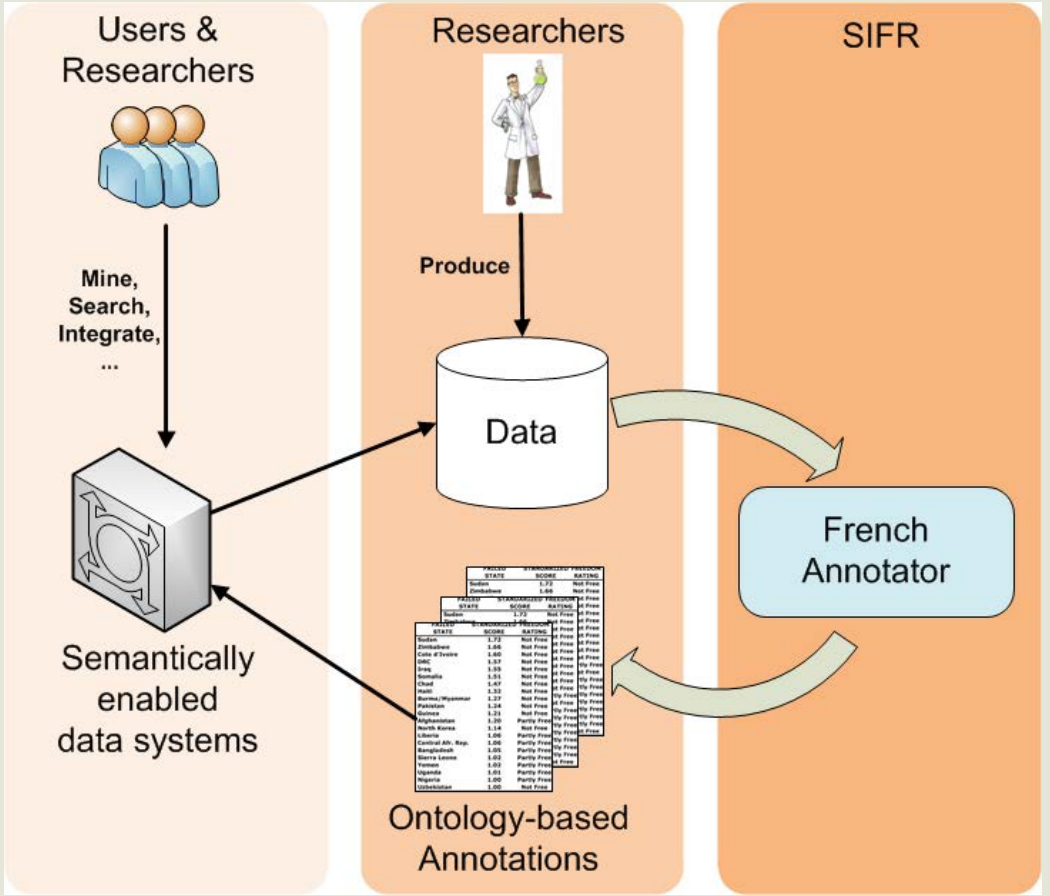
- 107 ontologies, 80 candidates
- 5 driving use cases, ~90 registered users

C. Jonquet, A. Annane, K. Bouarech, V. Emonet & S. Melzi. **SIFR BioPortal: French biomedical ontologies and terminologies available for semantic annotation**, In *16th Journées Francophones d'Informatique Médicale, JFIM'16*. Genève, Suisse, July 2016.

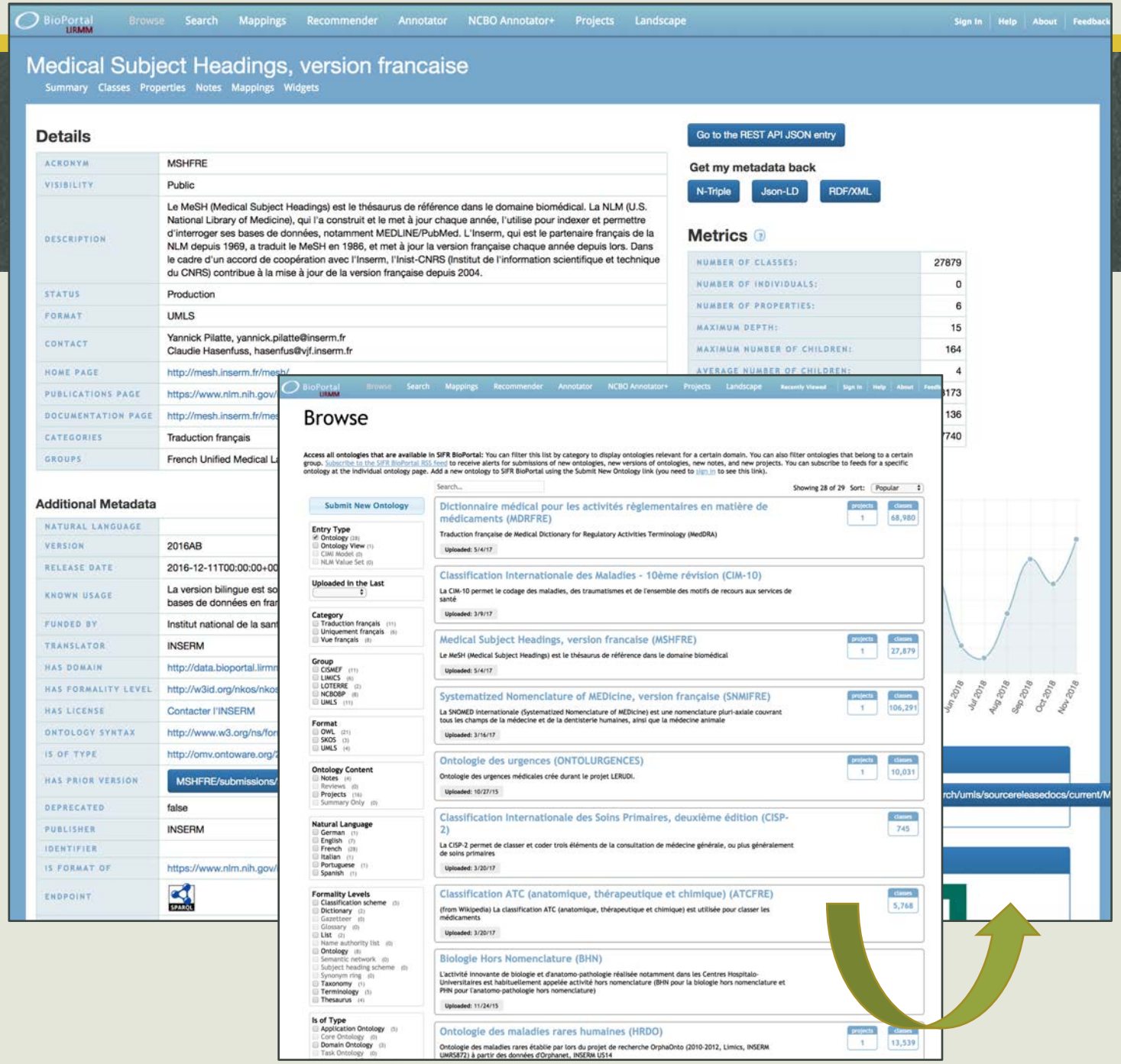
C. Jonquet, A. Toulet, (…) P. Larmande. **AgroPortal: an ontology repository for agronomy**, *Computers and Electronics in Agriculture*. Jan 2018. 144, pp.126-143. Elsevier.

SIFR: Semantic Indexing of French Biomedical Data Resources
http://www.lirmm.fr/sifr

- Ontology-based services to index, mine and retrieve French biomedical data
- In France, there is already a reference repository for medical terminologies but nothing public for annotation
- Crucial need for tools & services for French biomedical data



A dedicated version of BioPortal for French ontologies



http://bioportal.lirmm.fr

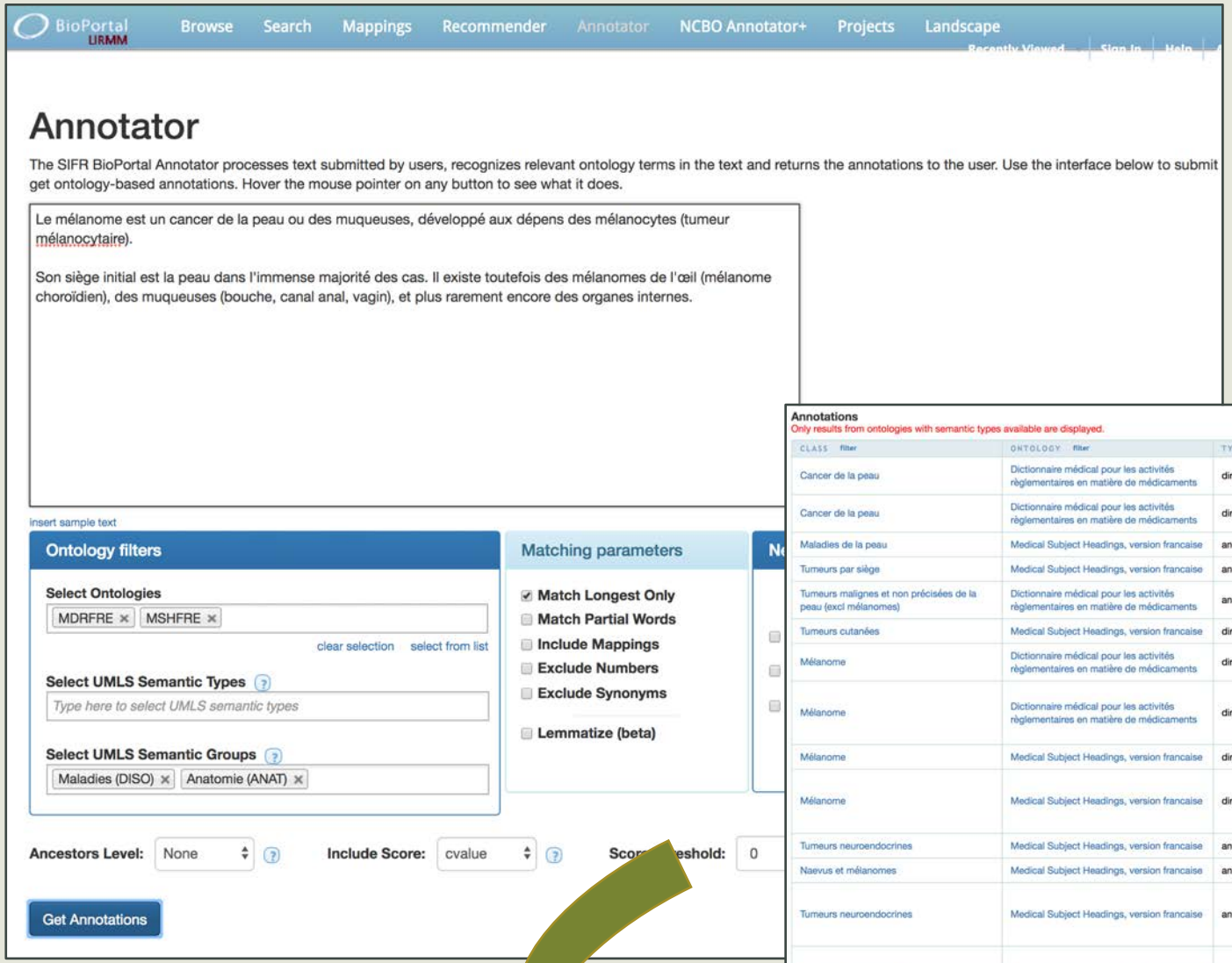
28 monolingual ontologies/terminologies

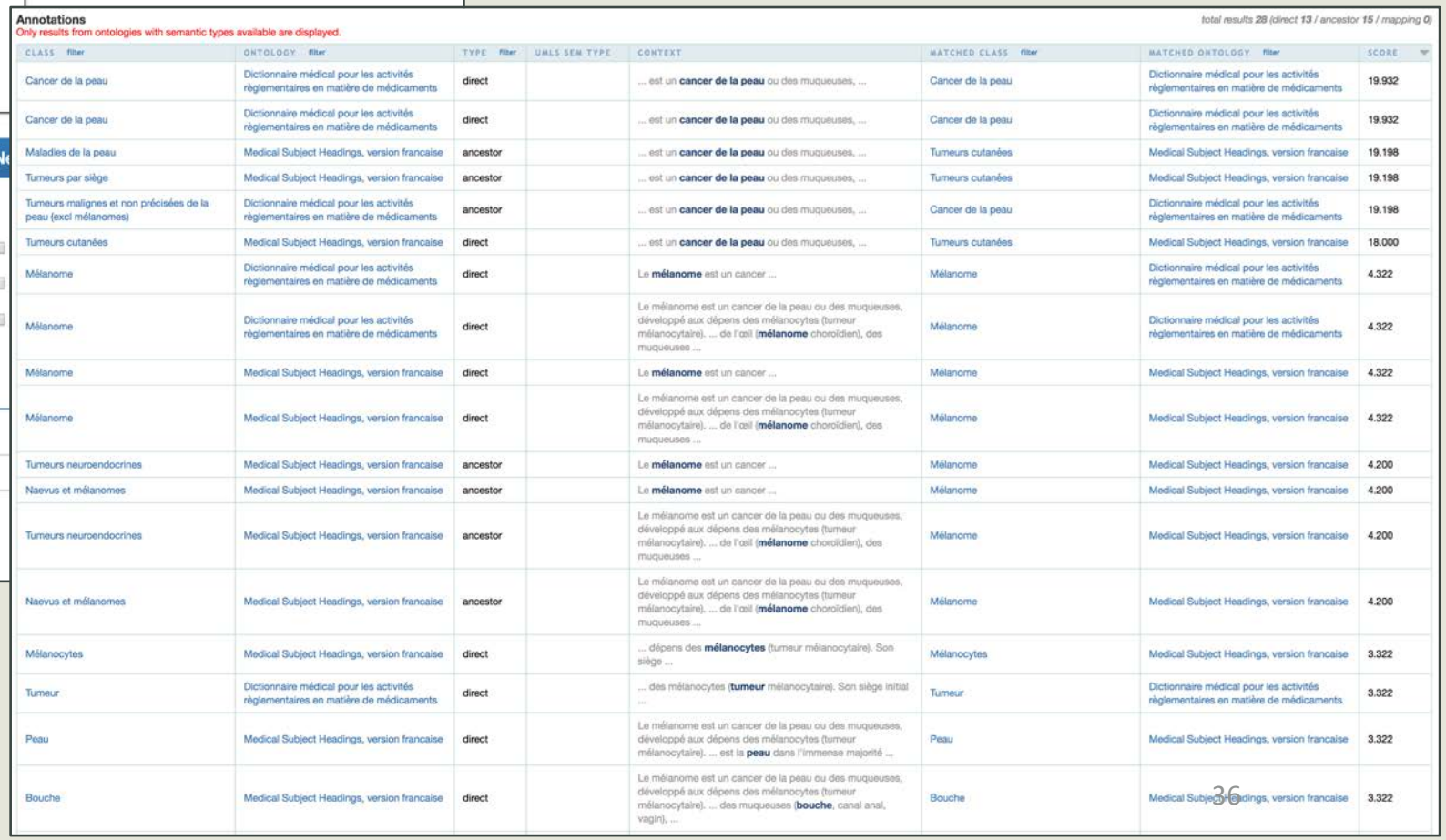
- From the UMLS or HeTOP or uploaded by users
- Cleaned and checked for annoation

C. Jonquet, A. Annane, K. Bouarech, V. Emonet & S. Melzi. **SIFR BioPortal: French biomedical ontologies and terminologies available for semantic annotation**, In *16th Journées Francophones d'Informatique Médicale JFIM'16*. Genève, Suisse, July 2016.

French/SIFR Annotator

http://bioportal.lirmm.fr/annotator





Annotations

Only results from ontologies with semantic types available are displayed.

total results 28 (direct 13 / ancestor 15 / mapping 0)

CLASS	ONTOLOGY	TYPE	UMLS SEM TYPE	CONTEXT	MATCHED CLASS	MATCHED ONTOLOGY	SCORE
Cancer de la peau	Dictionnaire médical pour les activités règlementaires en matière de médicaments	direct		... est un **cancer de la peau** ou des muqueuses, ...	Cancer de la peau	Dictionnaire médical pour les activités règlementaires en matière de médicaments	19.932
Cancer de la peau	Dictionnaire médical pour les activités règlementaires en matière de médicaments	direct		... est un **cancer de la peau** ou des muqueuses, ...	Cancer de la peau	Dictionnaire médical pour les activités règlementaires en matière de médicaments	19.932
Maladies de la peau	Medical Subject Headings, version francaise	ancestor		... est un **cancer de la peau** ou des muqueuses, ...	Tumeurs cutanées	Medical Subject Headings, version francaise	19.198
Tumeurs par siège	Medical Subject Headings, version francaise	ancestor		... est un **cancer de la peau** ou des muqueuses, ...	Tumeurs cutanées	Medical Subject Headings, version francaise	19.198
Tumeurs malignes et non précisées de la peau (excl mélanomes)	Dictionnaire médical pour les activités règlementaires en matière de médicaments	ancestor		... est un **cancer de la peau** ou des muqueuses, ...	Cancer de la peau	Dictionnaire médical pour les activités règlementaires en matière de médicaments	19.198
Tumeurs cutanées	Medical Subject Headings, version francaise	direct		... est un **cancer de la peau** ou des muqueuses, ...	Tumeurs cutanées	Medical Subject Headings, version francaise	18.000
Mélanome	Dictionnaire médical pour les activités règlementaires en matière de médicaments	direct		Le **mélanome** est un cancer ...	Mélanome	Dictionnaire médical pour les activités règlementaires en matière de médicaments	4.322
Mélanome	Dictionnaire médical pour les activités règlementaires en matière de médicaments	direct		Le mélanome est un cancer de la peau ou des muqueuses, développé aux dépens des mélanocytes (tumeur mélanocytaire). ... de l'œil (**mélanome** choroïdien), des muqueuses ...	Mélanome	Dictionnaire médical pour les activités règlementaires en matière de médicaments	4.322
Mélanome	Medical Subject Headings, version francaise	direct		Le **mélanome** est un cancer ...	Mélanome	Medical Subject Headings, version francaise	4.322
Mélanome	Medical Subject Headings, version francaise	direct		Le mélanome est un cancer de la peau ou des muqueuses, développé aux dépens des mélanocytes (tumeur mélanocytaire). ... de l'œil (**mélanome** choroïdien), des muqueuses ...	Mélanome	Medical Subject Headings, version francaise	4.322
Tumeurs neuroendocrines	Medical Subject Headings, version francaise	ancestor		Le **mélanome** est un cancer ...	Mélanome	Medical Subject Headings, version francaise	4.200
Naevus et mélanomes	Medical Subject Headings, version francaise	ancestor		Le **mélanome** est un cancer ...	Mélanome	Medical Subject Headings, version francaise	4.200
Tumeurs neuroendocrines	Medical Subject Headings, version francaise	ancestor		Le mélanome est un cancer de la peau ou des muqueuses, développé aux dépens des mélanocytes (tumeur mélanocytaire). ... de l'œil (**mélanome** choroïdien), des muqueuses ...	Mélanome	Medical Subject Headings, version francaise	4.200
Naevus et mélanomes	Medical Subject Headings, version francaise	ancestor		Le mélanome est un cancer de la peau ou des muqueuses, développé aux dépens des mélanocytes (tumeur mélanocytaire). ... de l'œil (**mélanome** choroïdien), des muqueuses ...	Mélanome	Medical Subject Headings, version francaise	4.200
Mélanocytes	Medical Subject Headings, version francaise	direct		... dépens des **mélanocytes** (tumeur mélanocytaire). Son siège ...	Mélanocytes	Medical Subject Headings, version francaise	3.322
Tumeur	Dictionnaire médical pour les activités règlementaires en matière de médicaments	direct		... des mélanocytes (**tumeur** mélanocytaire). Son siège initial ...	Tumeur	Dictionnaire médical pour les activités règlementaires en matière de médicaments	3.322
Peau	Medical Subject Headings, version francaise	direct		Le mélanome est un cancer de la peau ou des muqueuses, développé aux dépens des mélanocytes (tumeur mélanocytaire). ... est la **peau** dans l'immense majorité ...	Peau	Medical Subject Headings, version francaise	3.322
Bouche	Medical Subject Headings, version francaise	direct		Le mélanome est un cancer de la peau ou des muqueuses, développé aux dépens des mélanocytes (tumeur mélanocytaire). ... des muqueuses (**bouche**, canal anal, vagin), ...	Bouche	Medical Subject Headings, version francaise	3.322

A. Tchechmedjiev, ..., C. Jonquet. **Ontology-Based Semantic Annotation of French Biomedical Text and Clinical Notes** BMC *Bioinformatics*, 19:405, 2018.

AgroPortal: a vocabulary and ontology repository for agronomy
http://agroportal.lirmm.fr

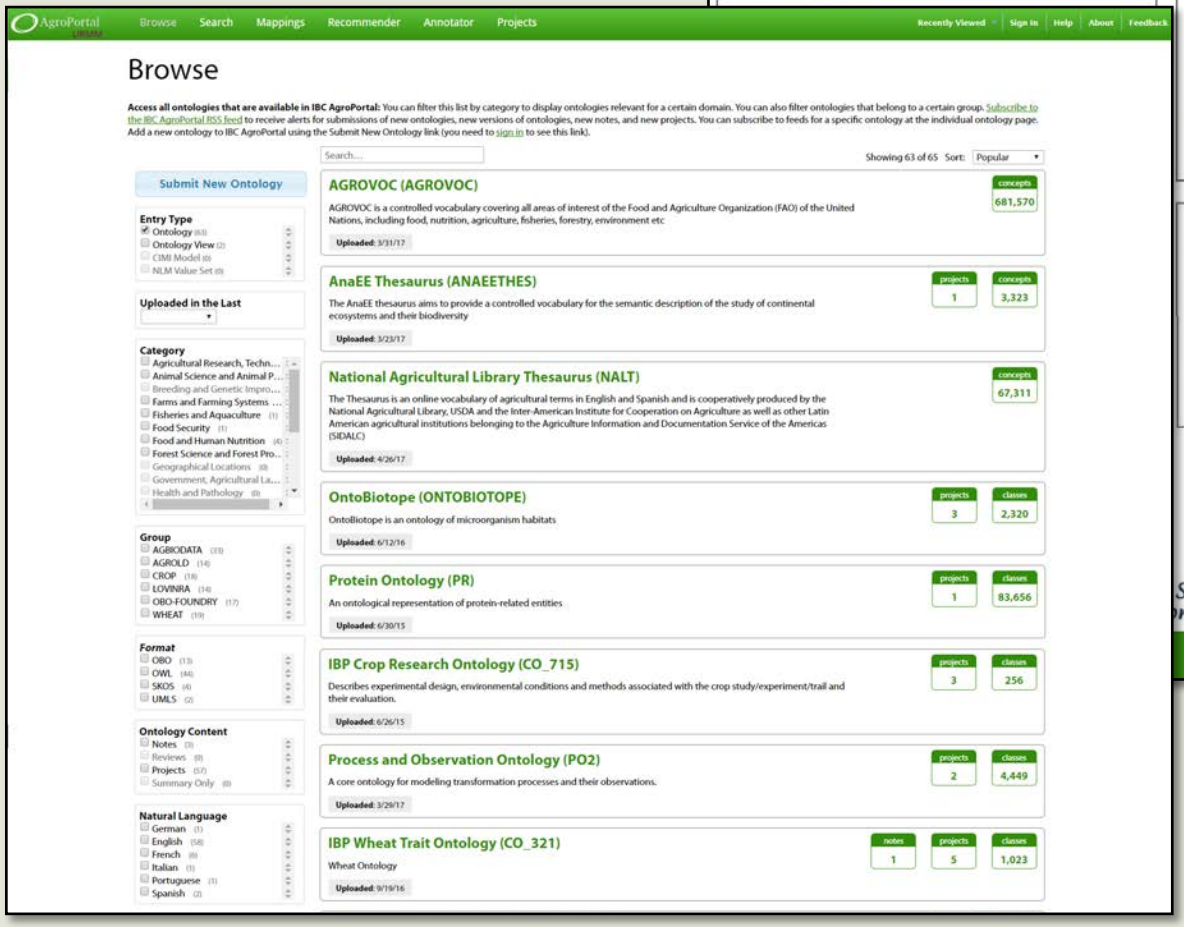
- Develop and support a reference ontology repository
  - Primary focus on the agronomy & close related domains (plant sciences, food and biodiversity)

- Reusing the NCBO BioPortal technology
  - Avoid to re-implement what has been done, facilitate interoperability
  - Reusing the scientific outcomes, experience & methods of the biomedical domain

- Enable straightforward use of agronomic related ontologies
  - Respect the requirements & specificities of the agronomic community
  - Fully semantic web compliant infrastructure
  - Enable new science

AgroPortal a vocabulary and ontology repository for agronomy, food, plant sciences & biodiversity

- Publish, search, download
- Browse, visualize
- Peer review
- Versioning
- Annotation
- Recommendation
- Mapping
- Notes
- Projects



http://agroportal.lirmm.fr

- 107 ontologies, 80 candidates
- 5 driving use cases
- ~90 registered users

C. Jonquet, (…) anP. Larmande. **AgroPortal: a vocabulary and ontology repository for agronomy**, *Computers and Electronics in Agriculture*. Jan 2018. Elsevier.

AgroPortal LIRMM | Browse | Search | Mappings | Recommender | Annotator | Projects | Landscape | Sign In | Help | About | Feedback

Cite Us

Use AgroPortal to access and share ontologies. You can create ontology-based annotations for your own text, link your own project that uses ontologies to the description of those ontologies, find and create relations between terms in different ontologies, review and comment on ontologies and their components as you browse them. Sign in to AgroPortal to submit a new ontology or ontology-based project, provide comments on ontologies or add ontology mappings.

Current Release: 4.24 (February 2016)
Issue tracking on GitHub

Search all ontologies

Enter concept, e.g. Melanoma | Search

Advanced Search

Find an ontology

Enter ontology name, e.g. NCI Thesaurus | Explore

Browse Ontologies >

Links

{API} | SPARQL

Ontology Visits (July 2017)

AnaEE Thesaurus (ANAEETHES)	95
AGROVOC (AGROVOC)	94
National Agricultural Library Thesaurus (NALT)	41
OntoBiotope (ONTOBIOTOPE)	36
Wheat Trait Ontology (WHEATPHENOTYPE)	27

More

Latest Notes

Terms in double (IBP Wheat Trait Ontology)
5 months ago by jonquet
A bunch of the terms in this branch are in double. Is this normal ?

Un peu d'histoire (Banana Anatomy)
over 1 year ago by antoulet
Inflorescence est un mot d'origine latine qui signifie "fleurir". Il est le même en français et e...

Can measure by mapped to another ontology ? (Biorefinery)
over 1 year ago by jonquet
Such as Unit of Measurement ?

Is spadice a kind of inflorescence for banana? (Banana Anatomy)
over 1 year ago by jonquet
Can we consider spadice an appropriate inflorescence for banana?

Slices

- Crop Ontology Curation Tool (crop)
- INRA Linked Open Vocabularies (lovinra)
- OBO Foundry (obo-foundry)
- The Agronomic Linked Data (AgroLD) (agrold)
- Consortium of Agricultural Biological Databases (agbiodata)
- RDA Wheat Data Interoperability working group (wheat)
- Exclusive AgroPortal ontologies (exclu)

Statistics

Ontologies	64
Classes	1,199,915
Individuals	1,377,548
Projects	32
Users	77

Latest Mappings

zooplankton (ANAEETHES) <=> OMIT_0015869 (http://purl.obolibrary.org/obo/omit.owl)
External Mapping 04/25/2017 by jonquet

QTL (SO) <=> QTL (http://www.southgreen.fr/agrold/resource)
External Mapping 04/06/2017 by larmande

With the collaboration of

NATIONAL CENTER FOR BIOMEDICAL ONTOLOGY | SIFR project | LIRMM

cnrs | Bioversity International | INRA SCIENCE & IMPACT | IRD Institut de recherche pour le développement | cirad

Supported by

ANR | Labex NUMEV | IBC Institut de biologie computationnelle

Powered by NCBO BioPortal

5 Driving Agronomic Use Cases

- IBC Rice Genomics & AgroLD project
  - Data integration and knowledge management related to rice (P. Larmande)
- RDA Wheat Data Interoperability working group
  - Common framework for publishing wheat data (E. Dzalé-Yeumo)
- LovInra : INRA Linked Open Vocabularies
  - Vocabularies produced by INRA scientists (S. Aubin)
- Crop Ontology project
  - Ontologies for describing crop germplasm & traits (E. Arnaud)
- GODAN global map of agri-food data standards
  - VEST/AgroPortal MAP of standards (V. Pesce)

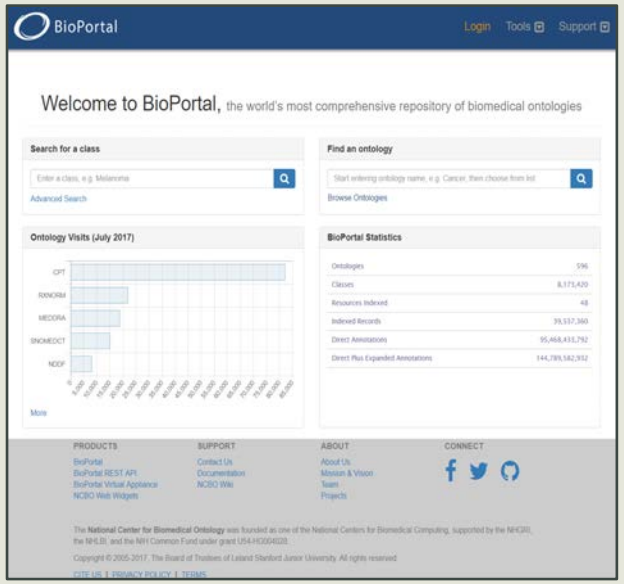
Examples of ontologies uploaded in AgroPortal

Title	Format	Groups	Size
IBP Rice Trait Ontology (CO_320)	OWL	CROP, RICE	~2K
IBP Wheat Trait Ontology (CO_321)	OWL	CROP, WHEAT	~1K
IBP Wheat Anatomy Ontology (CO_121)	OBO	CROP, WHEAT	~80
IBP Crop Research (CO_715)	OBO	CROP	~250
Multi-Crop Passport Ontology (CO_020)	OBO	CROP	~90
Biorefinery (BIOREFINERY)	OWL	LOVINRA	~300
Matter Transfer (TRANSMAT)	OWL	LOVINRA	~1.1K
Plant Ontology (PO)	OWL	WHEAT, RICE, OBOF	~2K
Plant Trait Ontology (TO)	OWL	WHEAT, RICE, OBOF	~4.4K
Durum Wheat (DURUM_WHEAT)	OWL	LOVINRA	~130
Agricultural Experiments (AEO)	OWL	LOVINRA	~60
Environment Ontology (ENVO)	OWL	WHEAT, OBOF	~6.3K
NCBI Organismal Classification (NCBITAXON)	RRF	WHEAT	~900K
AnaEE Thesaurus (ANAEE)	SKOS	LOVINRA	~3.3K
French Crop Usage (CROPUSAGE)	SKOS	none	~300
Agrovoc (AGROVOC)	SKOS	none	~32K
Food Ontology (FOODON)	OWL	OBOF	~10K
National Agriculture Library Thesaurus (NALT)	SKOS	none	~67K
Global Agricultural Concept Scheme (GACS)	SKOS	none	~585K

Tutorial material

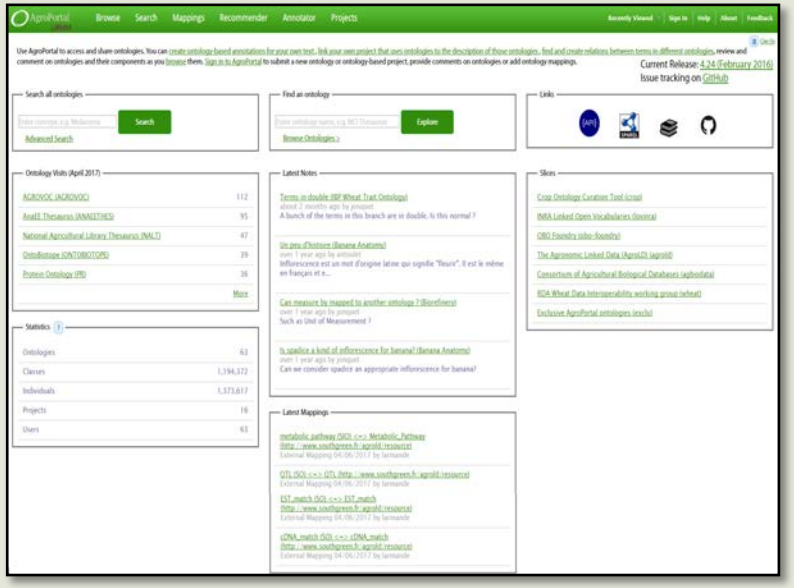
Use of NCBO BioPortal or another instance of the technology

NCBO BioPortal



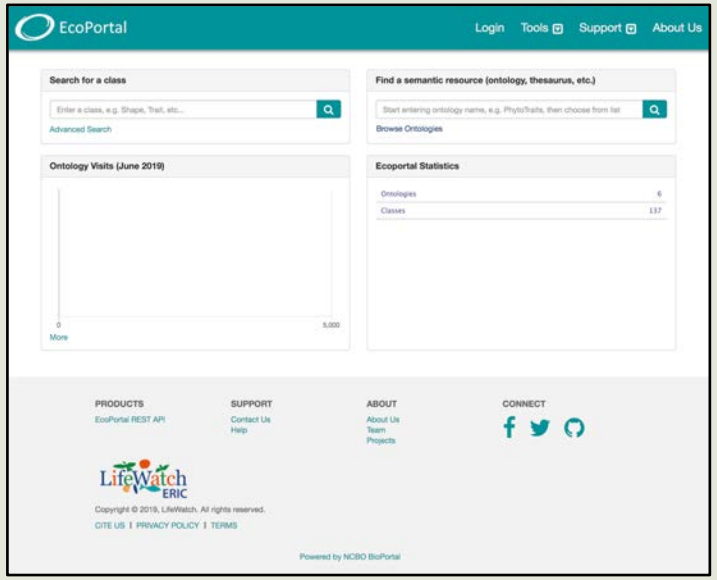
http://bioportal.bioontology.org

AgroPortal



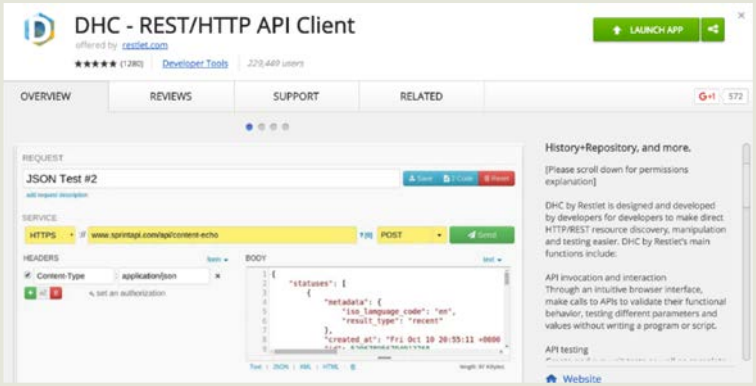
http://agroportal.lirmm.fr

EcoPortal

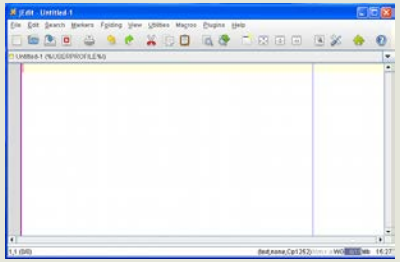


http://ecoportal.lifewatchitaly.eu/

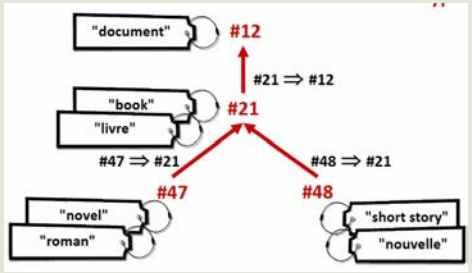
➔ A web browser to use the web application



➔ A REST client for advanced REST web service calls (DHC, cURL, etc.)



➔ A text editor



➔ One ontology (preferably in OWL or SKOS)

During the tutorial

Demo

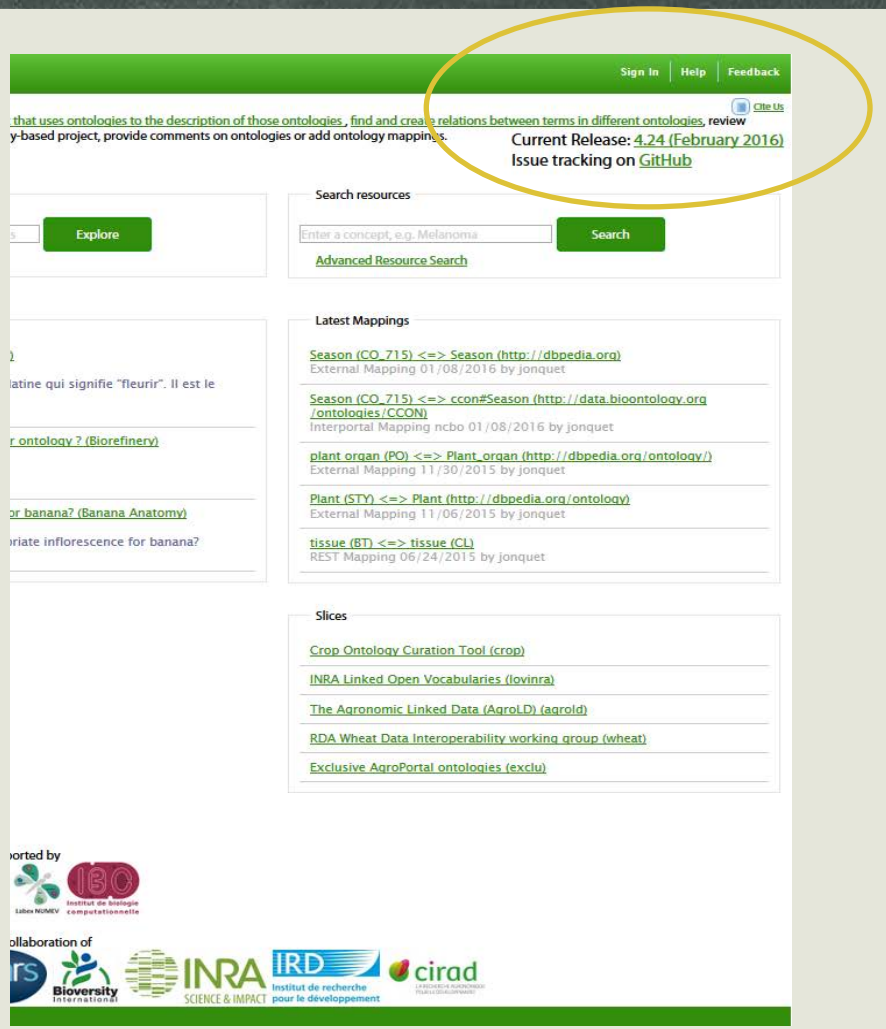
Exercise

Ressources

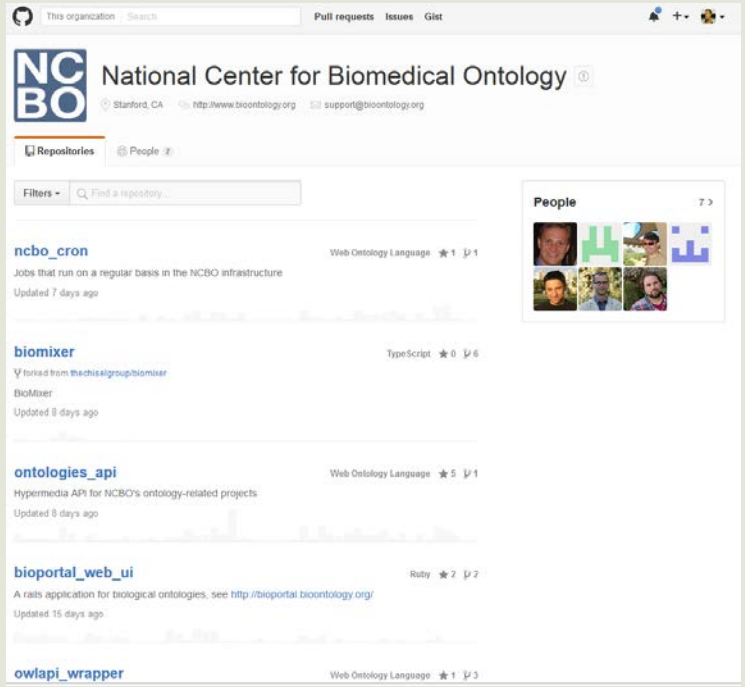
- Examples will be given with AgroPortal but (most of the time) equivalent action or queries can be done on one of the other portal.
- For API, by changing the base URL
  - http://data.agroportal.lirmm.fr/
  - http://data.bioontology.org/
  - http://193.204.79.110:8080 (for EcoPortal)
- Documentation
  - AgroPortal: https://github.com/agroportal/documentation/wiki/
  - NCBO BioPortal: NCBO wiki

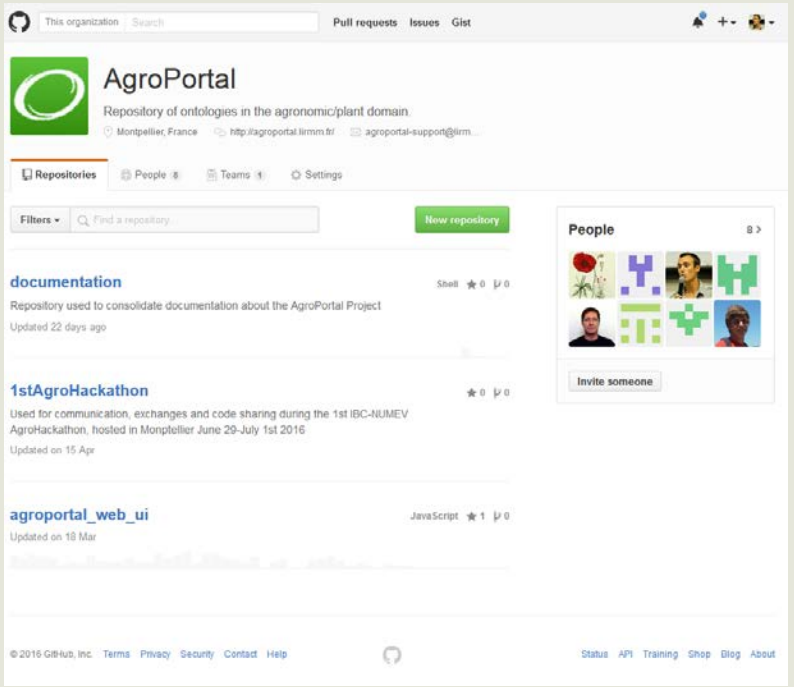
Create an account and get an APIkey

- Sign in > Create account
- Copy/paste your APIKey somewhere



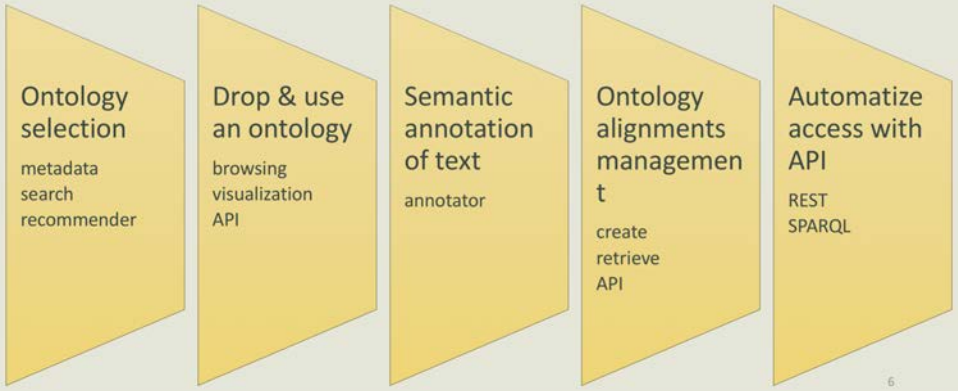
For those who would like to see the code a little closer





https://github.com/ncbo

https://github.com/agroportal



1. Ontology selection

- Use metadata
- Search within an ontology
- Use the Recommender
- Define metadata for your ontology

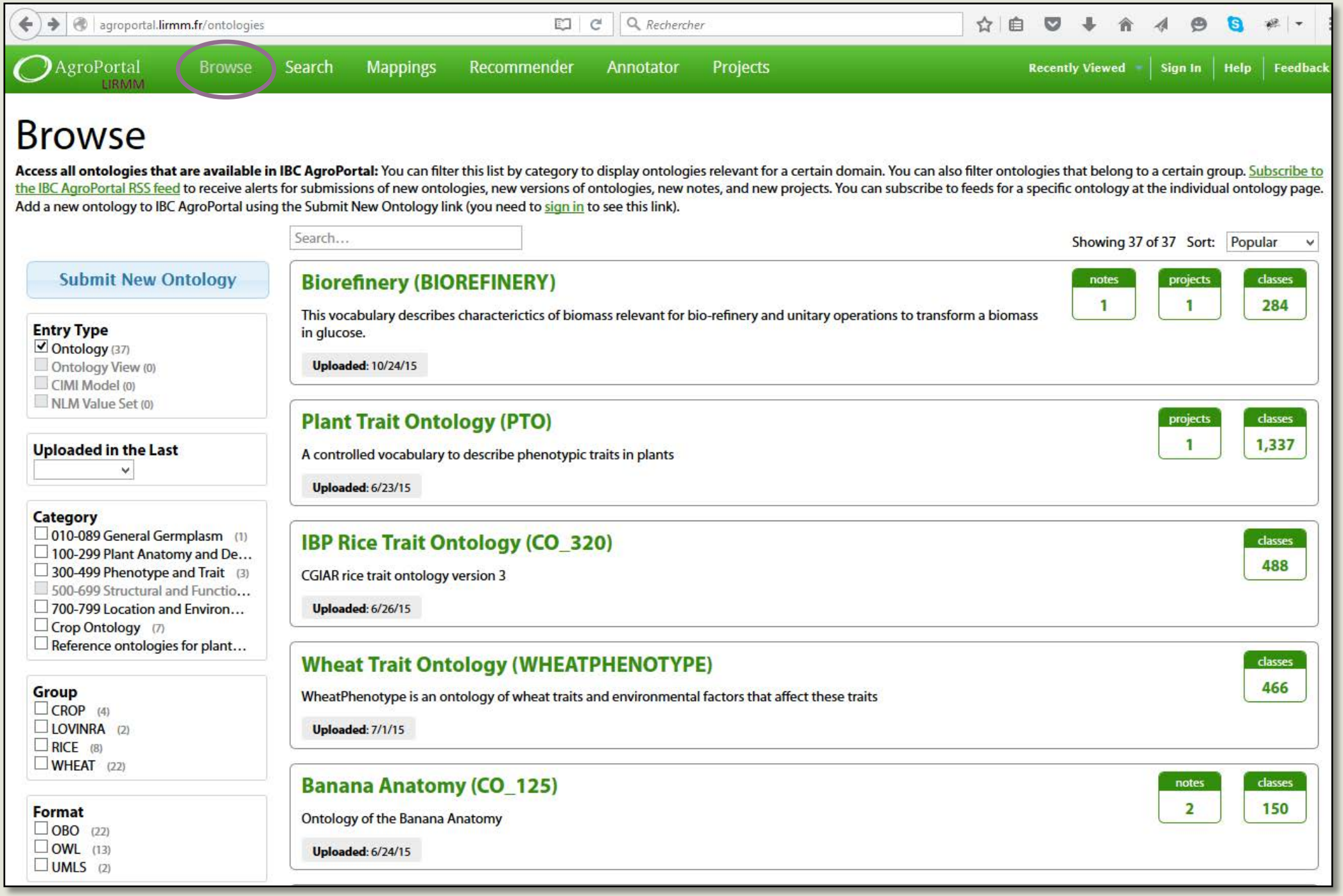
Why ontology selection and evaluation is hard?

- Large number and variety of ontologies (versions, platforms, formats, etc.), different complexity level (from terminology to ontologies)

- Automation of the selection process?

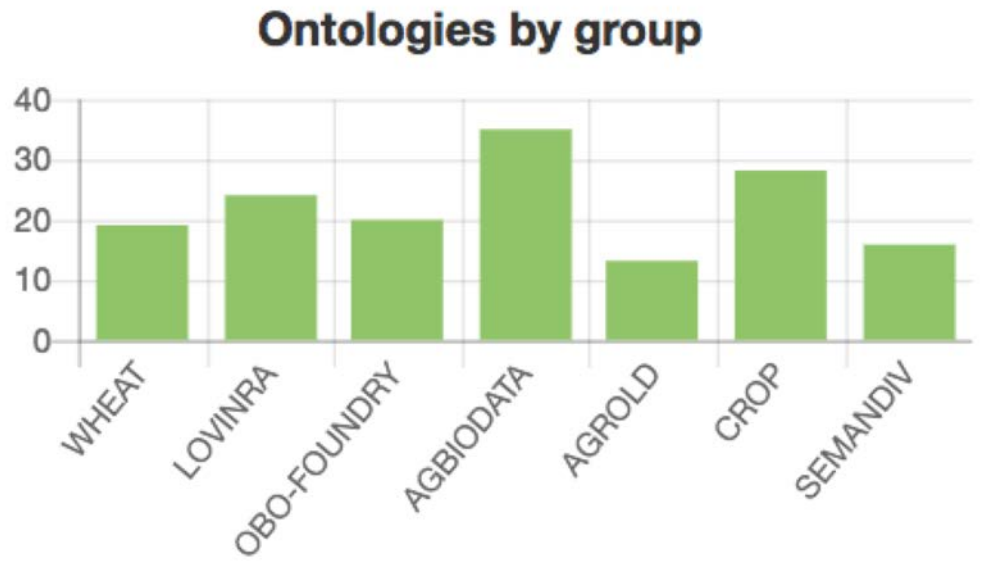
- Diversity of user requirements and expectations
  - Pick up an ontology for reuse in a knowledge based system
  - Ontology extension
  - Automatic substitution of an ontology by another one

- What's the risk of a bad choice?
  - Miss a relevant ontology
  - Miss connection/integration with other data that use the right ontologies
  - Miss possible reuse and start a new ontology


agroportal.lirmm.fr/ontologies
Rechercher
AgroPortal
LIRMM
Browse
Search
Mappings
Recommender
Annotator
Projects
Recently Viewed
Sign In
Help
Feedback
Browse
Access all ontologies that are available in IBC AgroPortal: You can filter this list by category to display ontologies relevant for a certain domain. You can also filter ontologies that belong to a certain group. Subscribe to the IBC AgroPortal RSS feed to receive alerts for submissions of new ontologies, new versions of ontologies, new notes, and new projects. You can subscribe to feeds for a specific ontology at the individual ontology page.
Add a new ontology to IBC AgroPortal using the Submit New Ontology link (you need to sign in to see this link).
Search…
Showing 37 of 37 Sort: Popular
Submit New Ontology
Entry Type
Ontology (37)
Ontology View (0)
CIMI Model (0)
NLM Value Set (0)
Uploaded in the Last
Category
010-089 General Germplasm (1)
100-299 Plant Anatomy and De…
300-499 Phenotype and Trait (3)
500-699 Structural and Functio…
700-799 Location and Environ…
Crop Ontology (7)
Reference ontologies for plant…
Group
CROP (4)
LOVINRA (2)
RICE (8)
WHEAT (22)
Format
OBO (22)
OWL (13)
UMLS (2)
Biorefinery (BIOREFINERY)
notes 1
projects 1
classes 284
This vocabulary describes characterictics of biomass relevant for bio-refinery and unitary operations to transform a biomass in glucose.
Uploaded: 10/24/15
Plant Trait Ontology (PTO)
projects 1
classes 1,337
A controlled vocabulary to describe phenotypic traits in plants
Uploaded: 6/23/15
IBP Rice Trait Ontology (CO_320)
classes 488
CGIAR rice trait ontology version 3
Uploaded: 6/26/15
Wheat Trait Ontology (WHEATPHENOTYPE)
classes 466
WheatPhenotype is an ontology of wheat traits and environmental factors that affect these traits
Uploaded: 7/1/15
Banana Anatomy (CO_125)
notes 2
classes 150
Ontology of the Banana Anatomy
Uploaded: 6/24/15

Ontology groups and categories

Category	Number
Plant Phenotypes and Traits	31
Plant Anatomy and Development	4
Natural Resources, Earth and Environment	12
Animal Science and Animal Products	6
Agricultural Research, Technology and Engineering	15
Breeding and Genetic Improvement	1
Plant Science and Plant Products	7
Plant Genetic Resources	2
Food and Human Nutrition	7
Food Security	2
Taxonomic Classifications of Organisms	6
Farms and Farming Systems	5
Fisheries and Aquaculture	2
Forest Science and Forest Products	2
Biodiversity and Ecology	14



Specific slices display to use only the ontologies of a group

http://lovinra.agroportal.lirmm.fr/

http://semandiv.agroportal.lirmm.fr/

Your turn!

Select an ontology by browsing or searching

OntoBiotope

Summary Classes Properties Notes Mappings Widgets Edit ontology information Add submission Edit submission information (1.2)

Details

ACRONYM	ONTOBIOTOPE
VISIBILITY	Public
DESCRIPTION	OntoBiotope is an ontology of microorganism habitats. Its modeling principle and its lexicon reflect the biotope classification used by biologists to describe microorganism isolation sites (e.g. GenBank, GOLD, ATCC). OntoBiotope is developed and maintained by the Meta-omics of Microbial Ecosystems (MEM) network in which 30 microbiologists from INRA (French National Institute for Agricultural Research) from all fields of applied microbiology participate. The relevance of OntoBiotope terms is evaluated through the PubMedBiotope semantic search engine. It identifies and categorizes microbial biotopes in all PubMed abstracts by applying the ToMap method (Text to Ontology Mapping) to the OntoBiotope ontology. It also indexes 3,35 millions relations between taxa and their habitats.
STATUS	Production
FORMAT	OBO
CONTACT	Claire Nédellec, claire.nedellec@inra.fr
HOME PAGE	http://lovinra.inra.fr/
PUBLICATIONS PAGE	https://doi.org/10.1186/1471-2105-16-S10-S1
DOCUMENTATION PAGE	http://lovinra.inra.fr/
CATEGORIES	Biodiversity and Ecology, Natural Resources, Earth and Environment
GROUPS	GDR SemanDiv, INRA Linked Open Vocabularies

Additional Metadata

URI	http://purl.obolibrary.org/obo/TEMP
NATURAL LANGUAGE	
VERSION	1.2
RELEASE DATE	2018-07-24T18:02:31+02:00

Go to the REST API JSON entry

Get my metadata back

N-Triple Json-LD RDF/XML

Metrics

NUMBER OF CLASSES:	2320
NUMBER OF INDIVIDUALS:	0
NUMBER OF PROPERTIES:	0
MAXIMUM DEPTH:	13
MAXIMUM NUMBER OF CHILDREN:	42
AVERAGE NUMBER OF CHILDREN:	3
CLASSES WITH A SINGLE CHILD:	248
CLASSES WITH MORE THAN 25 CHILDREN:	3
CLASSES WITH NO DEFINITION:	2320

Visits

Download as CSV

So much things to say about an ontology

Intrinsic

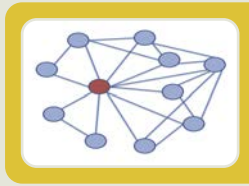
- names, acronym, language, ids, version, status, license, syntaxe, type, guidelines

People

- creator, contributor, publisher, contact, curator

Grouping

- domain, group



Relation

- imports, versions, views, related to, aligned to, used by, translation, generalization, specialization

Content

- key classes, dumps, partitions, example, changes

Community

- endorsments, reviews, notes, projects, analytics, support, audience

Date

- creation, modification, released, validation

Metrics

- classes,properties, individuals, depth, etc.

Provenance

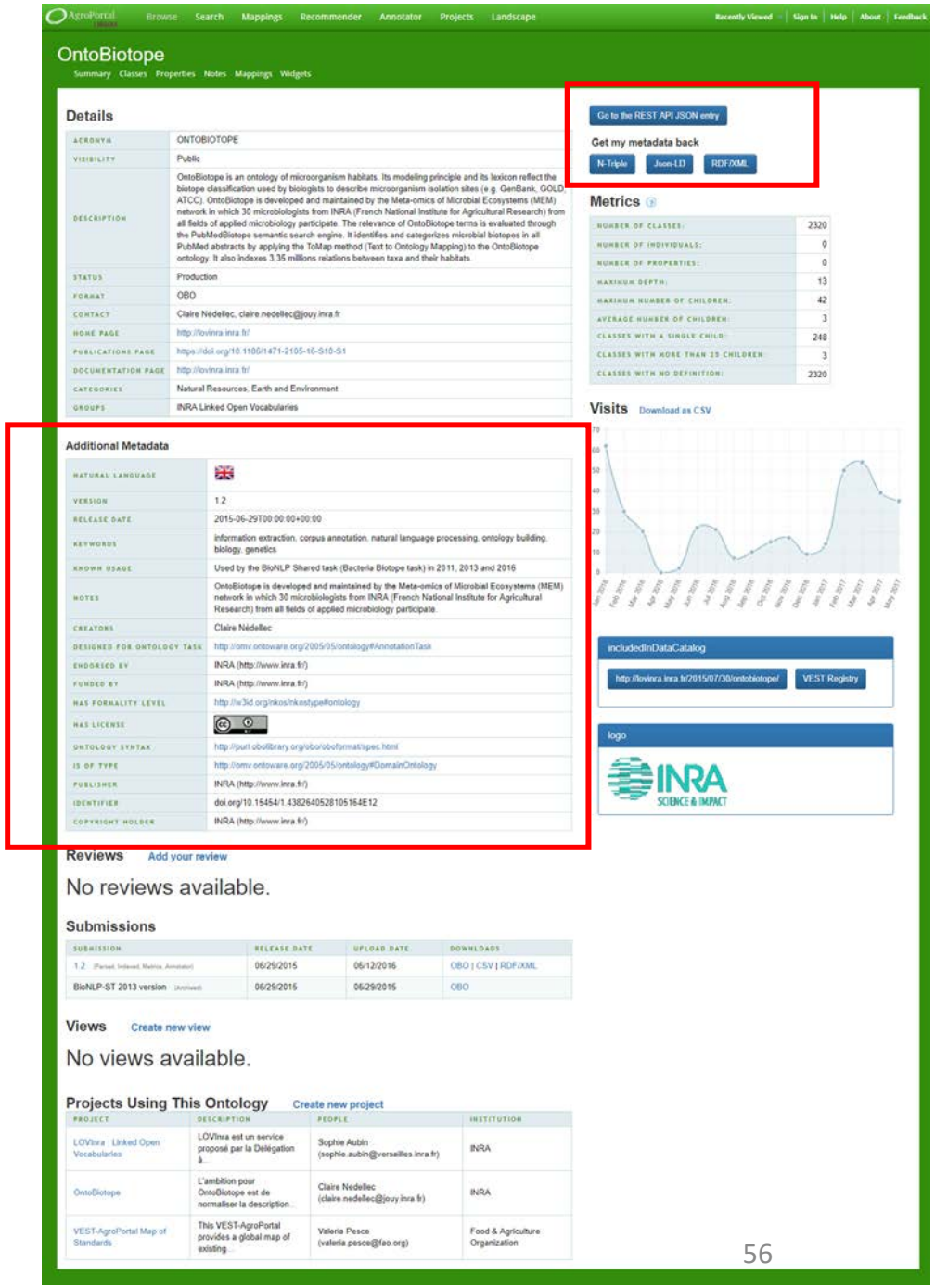
- Source, generated by, invalidated by

Description

- documentation, abstract, reference, notes, methods, tools, logo, property used, homepage

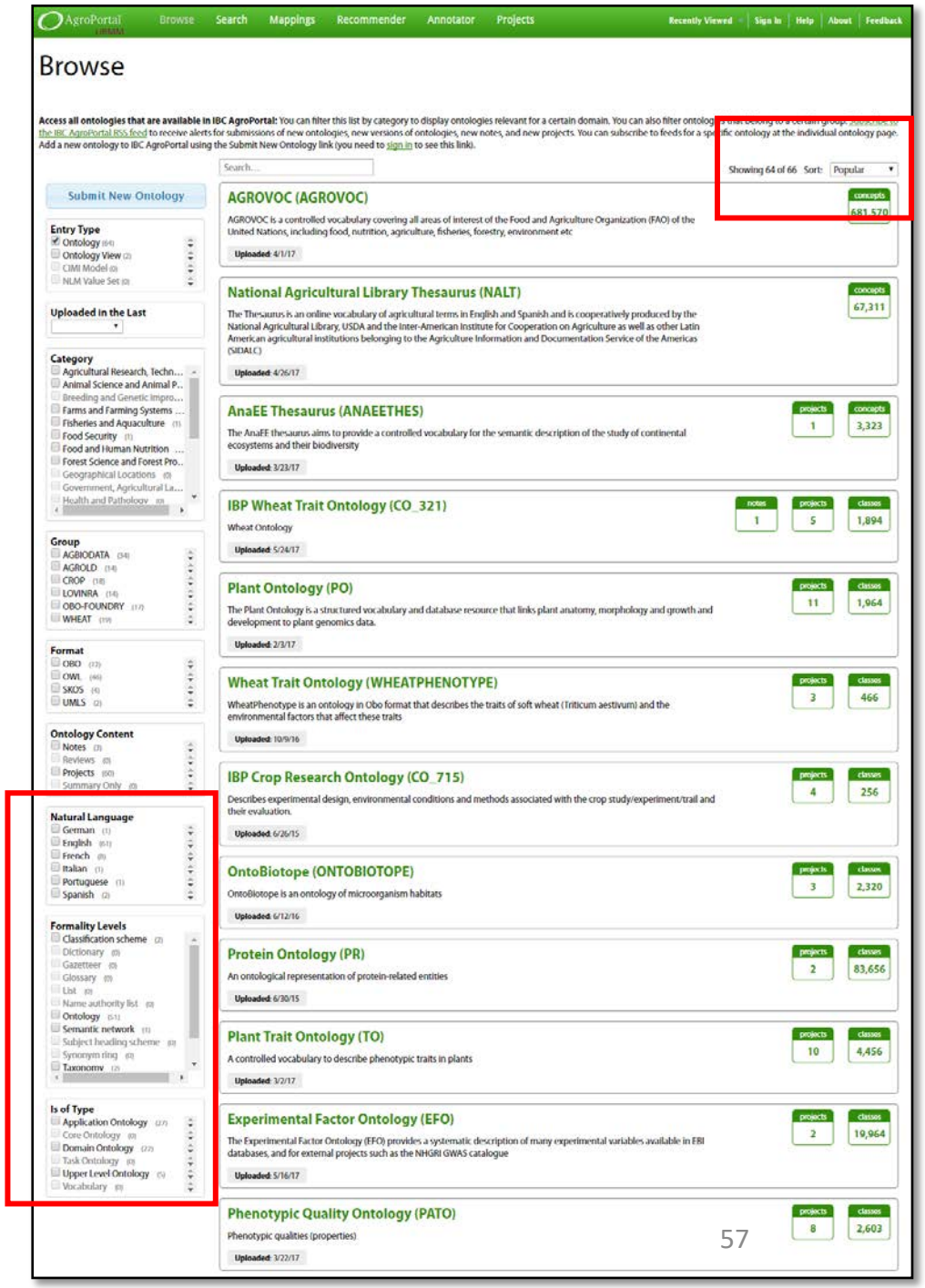
Describe ontologies with semantic metadata

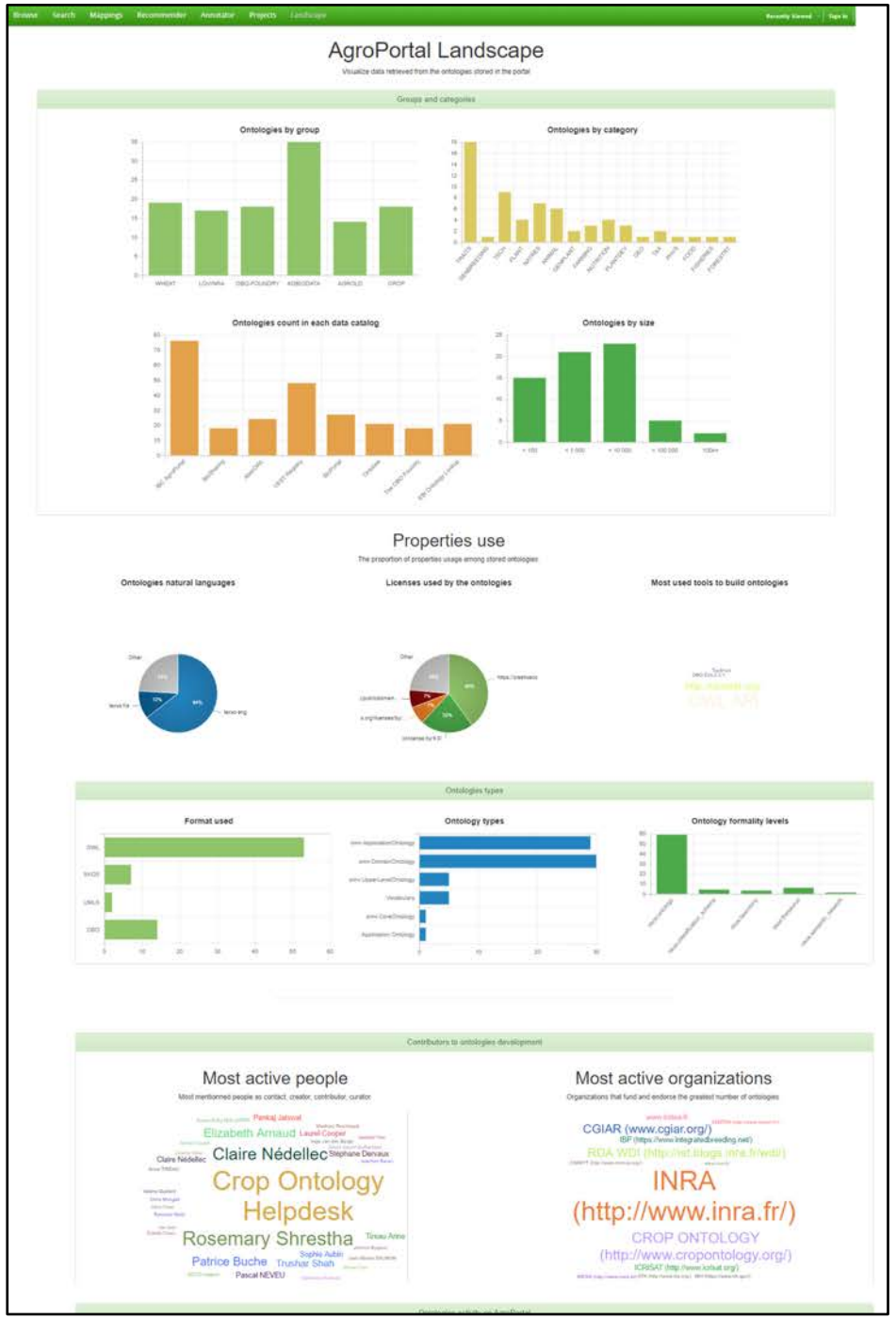
- Display “per ontology”
  - Ontology specific properties => viewable and editable within the ontology specific page
- Everything you need to know about an ontology
- URIs used in the backend to store the information
  - e.g., CC-BY => https://creativecommons.org/licenses/by-nd/4.0/
- “Get my metadata back” buttons



Browse and select ontologies

- Allows to search, order and select ontologies using a facetted search approach, based on the metadata
- 4 additional ways to filter ontologies in the list
- 2 new options to sort this list (name, released date).





AgroPortal landscape page

- Display “per property”

- Explore the agronomical ontology landscape by automatically aggregating the metadata fields of each ontologies in explicit visualizations

There are many many metadata vocabularies to describe your ontology…

Name Space	Name
rdfs	RDF Schema
omv	Ontology Metadata Vocabulary
owl	OWL 2 Web Ontology Language
dc	Dublin Core Metadata Element Set
dct	DC qualified
foaf	Friend of a Friend Vocabulary
void	Vocabulary of Interlinked Datasets
door	Descriptive Ontology of Ontology Relations
vann	Vocabulary for annotating vocabulary descriptions
adms	Asset Description Metadata Schema
voaf	Vocabulary of a Friend
dcat	Data Catalog Vocabulary
prov	Provenance Ontology
cc	Creative Commons Rights Expression Language
schema	Schema.org
skos	Simple Knowledge Organization System

- https://github.com/agroportal/documentation/tree/master/metadata

One example: SIO

<rdf:Description rdf:about="http://semanticscience.org/ontology/sio.owl">
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#Ontology"/>
<vann:preferredNamespacePrefix xml:lang="en">sio</vann:preferredNamespaceP
<dct:license rdf:resource="http://creativecommons.org/licenses/by/4.0/"/>
<cito:citesAsAuthority
rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI">http://www.jbiomedsem.com/content/5/1/14</cito:citesAsAuthority>
<owl:versionInfo rdf:datatype="http://www.w3.org/2001/XMLSchema#string">1.29.0</owl:versionInfo>
<dct:description xml:lang="en">The semanticscience integrated ontology (SIO) provides a simple (…). website: http://semanticscience.orgemail: sio-ontology@googlegroups.commailing list: http://groups.google.com/group/sio-ontology</dct:description>
<dct:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2010-03-29</dct:issued>
<dc:creator xml:lang="en">Michel Dumontier</dc:creator>
<vann:preferredNamespaceUri
rdf:datatype="http://www.w3.org/2001/XMLSchema#string">http://semanticscience.org/resource/</vann:preferredNamespaceUri>
<schema:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">general class inclusion axioms:'is part of' some 'physical entity' subClassOf 'is located in' some 'physical entity'role chains:'has capability' o 'is realized in' -> 'is participant in'</schema:comment>
<dc:contributor rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Contributors are those that engage in discussions in the context of SIO (in alphabetical order):christopher baker, joachim baran, (...) </dc:contributor>
<rdfs:seeAlso rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI">http://sio.semanticscience.org</rdfs:seeAlso>
<dct:rights rdf:datatype="http://www.w3.org/2001/XMLSchema#string">free to use,share,modify. modify with attribution [http://creativecommons.org/licenses/by/4.0/].</dct:rights>
<protege:defaultLanguage> en</protege:defaultLanguage>
<dct:creator rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI">http://orcid.org/0000-0003-4727-9435</dct:creator>
<dct:title xml:lang="en">Semanticscience Integrated Ontology (SIO)</dct:title>
<dc:identifier> sio.owl</dc:identifier>
<rdfs:isDefinedBy rdf:resource="http://semanticscience.org/ontology/sio.owl"/>
<owl:versionIRI rdf:resource="http://semanticscience.org/ontology/sio/v1.29.0/sio-release.owl"/>
<dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2016-05-18</dct:modified>
</rdf:Description>

Your turn!

Take your ontology and add 3 metadata fields

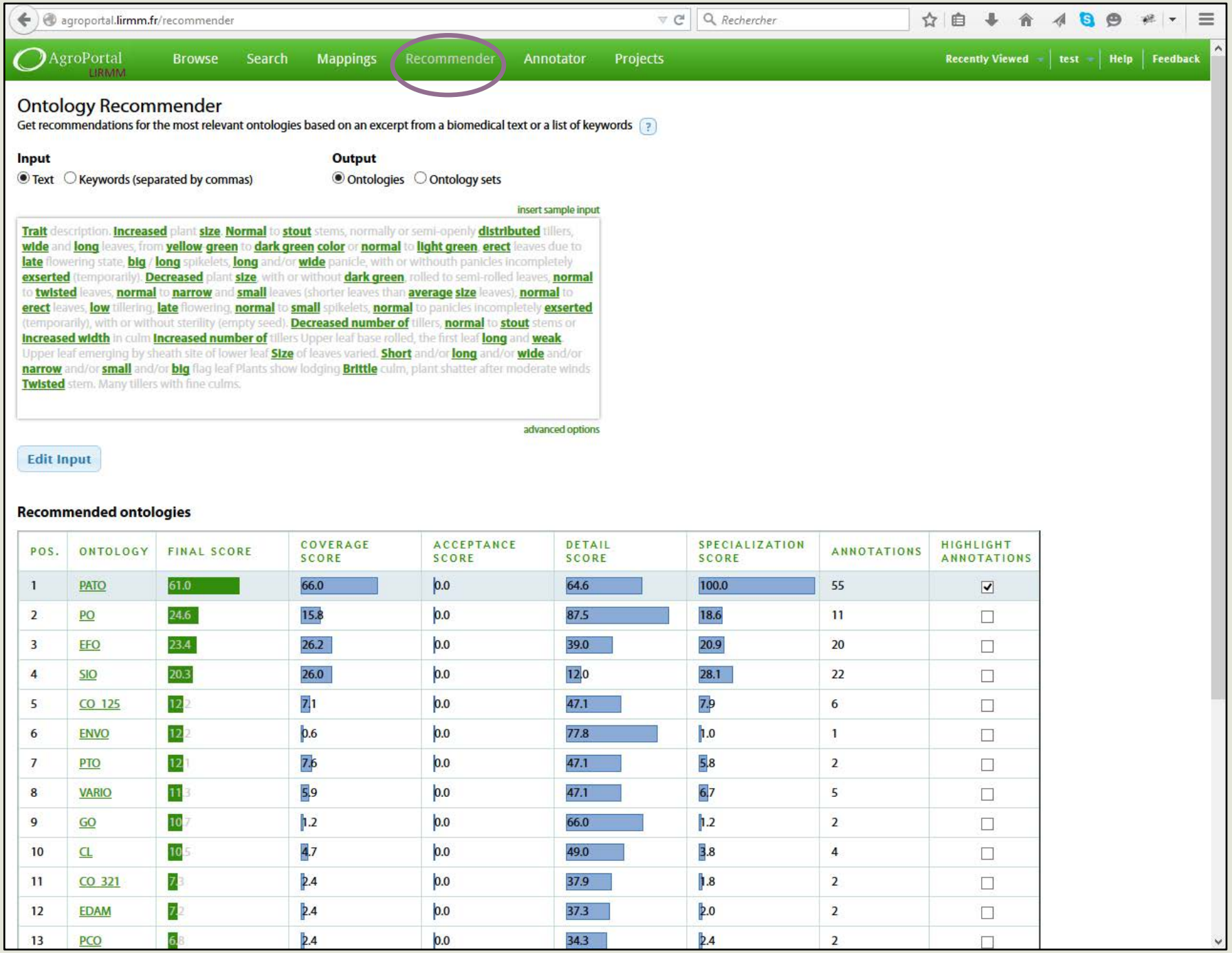
Tell us what you want to say about your ontology we'll tell you which property to use

Check out Dublin Core, DCAT, Schema.org …

A scoring algorithm for recommending ontologies

- (1) *coverage*, or the extent to which the ontology covers the input data;
- (2) the *acceptance* of the ontology in the community;
- (3) the level of *detail* of the ontology classes that cover the input data;
- (4) the *specialization* of the ontology to the domain of the input data.

$$score(o,t) = w_c * coverage(o,t) + w_a * acceptance(o) + w_d * detail(o,t) + w_s * specialization(o,t)$$



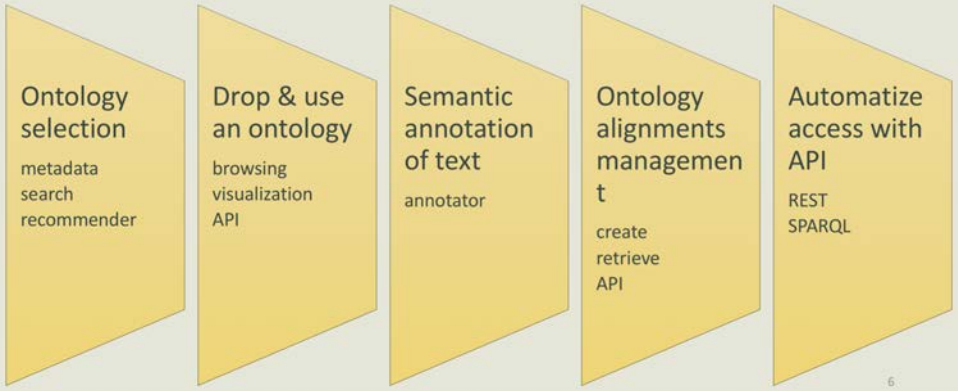
Recommender

M. Martinez-Romero, C. Jonquet, M. J. O'Connor, J. Graybeal, A. Pazos & M. A. Musen. **NCBO Ontology Recommender 2.0: An Enhanced Approach for Biomedical Ontology Recommendation**, *Biomedical Semantics*. June 2017. Vol. 8 (21).

Your turn!

Take the summary of your last article and get a recommendation for that content

Enter a list of terms that you would like to find in an ontology to identify the one that offers the best coverage

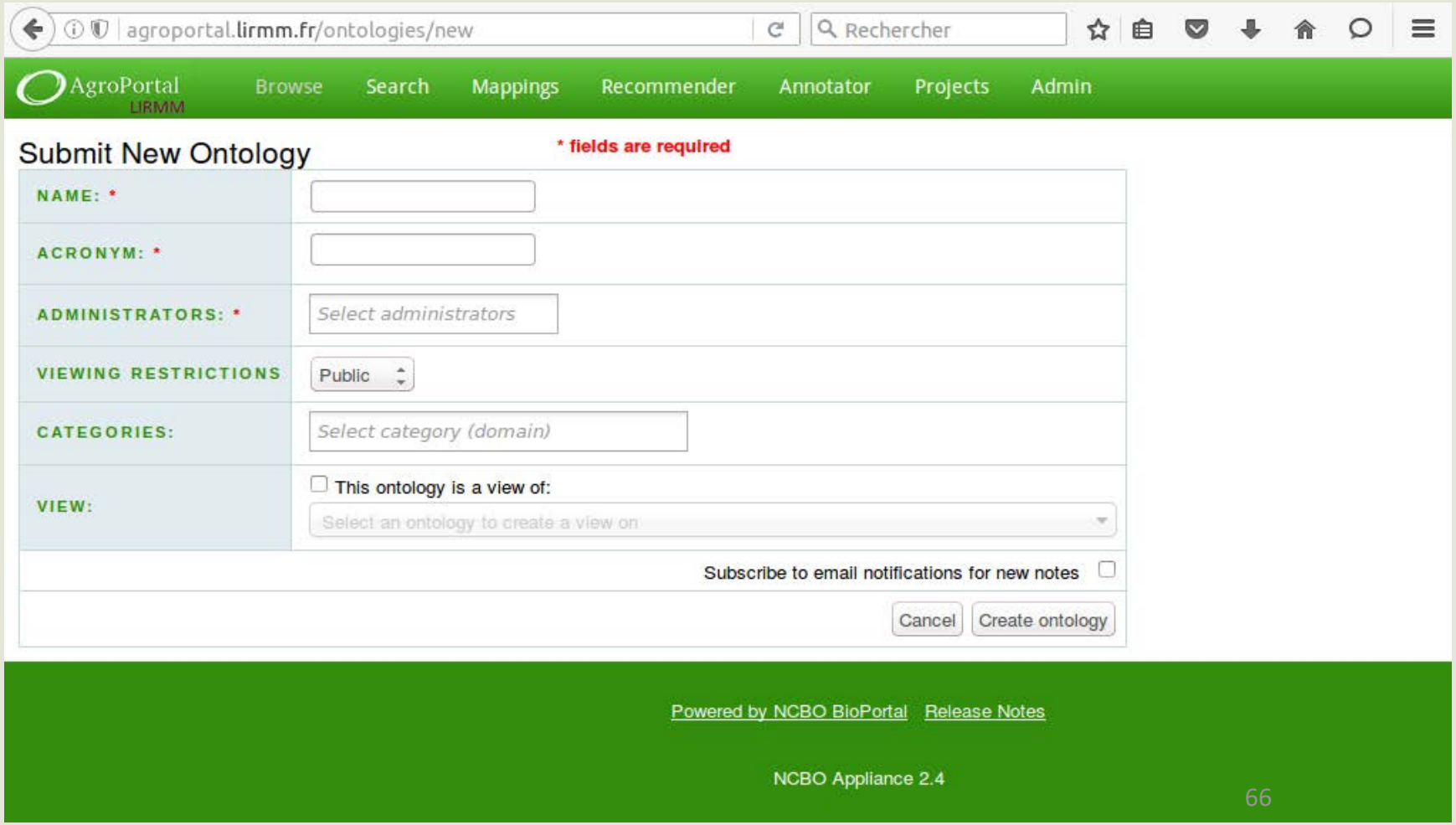


Drop and use an ontology

- Submit an ontology in the repository
- Browse and visualize an ontology
- Access the API for an ontology

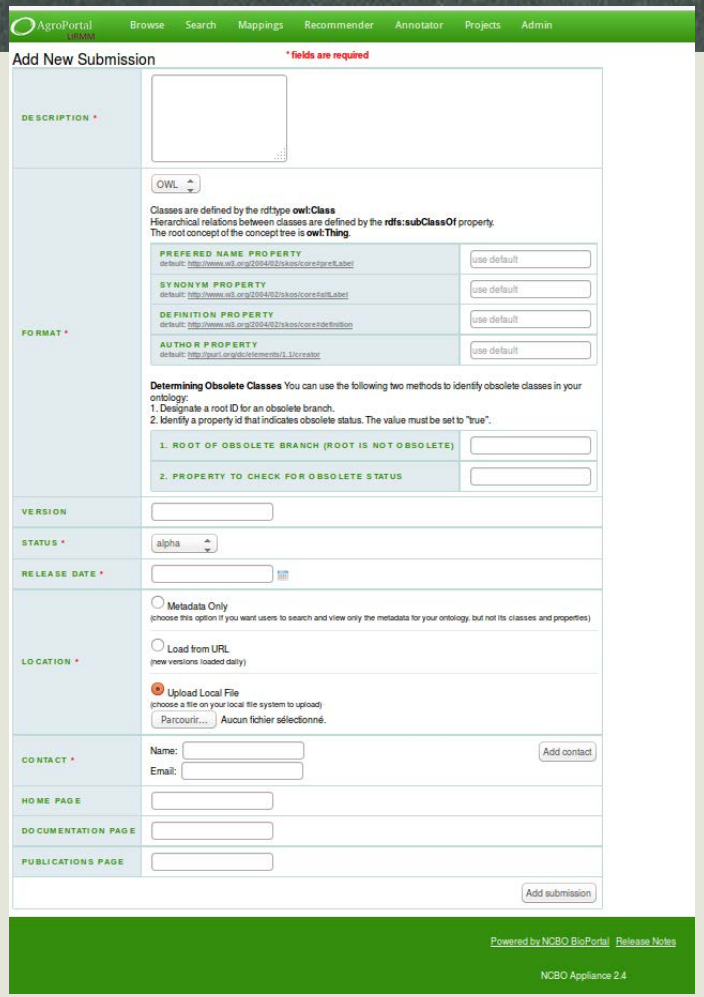
Upload an ontology in AgroPortal (1/2)

- 1. Creation of the skeleton

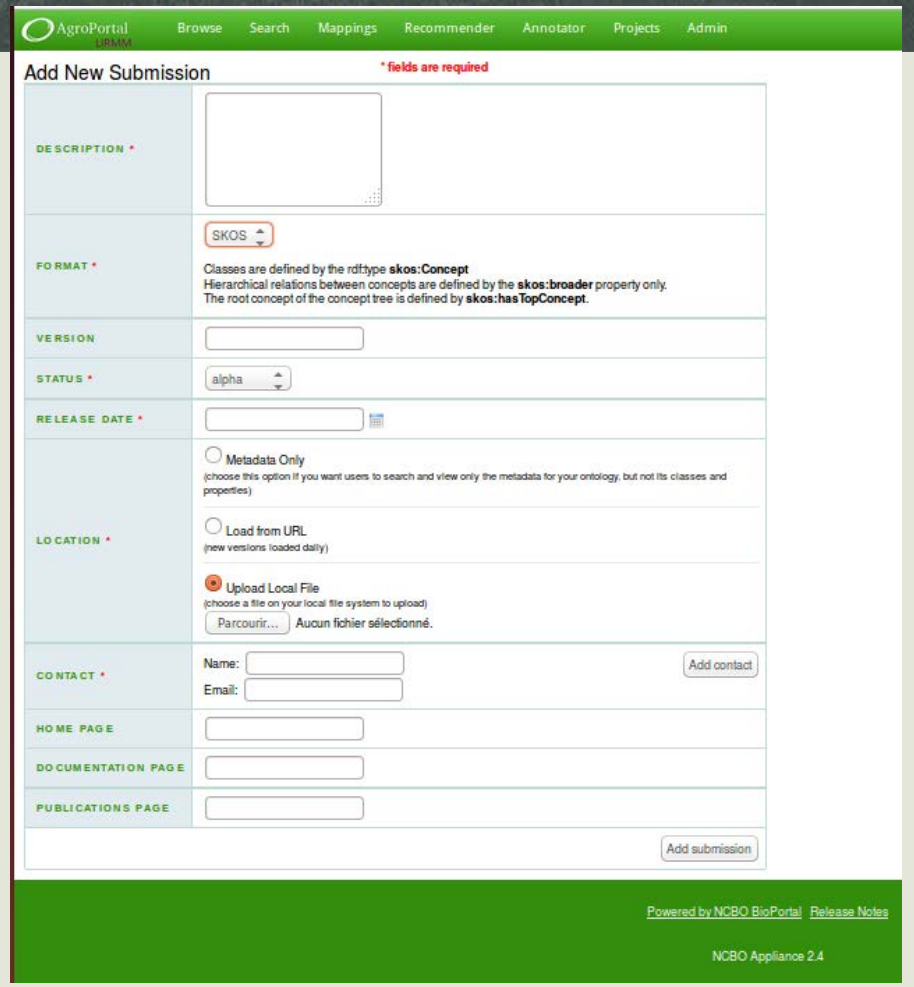


Upload an ontology in AgroPortal (2/2)

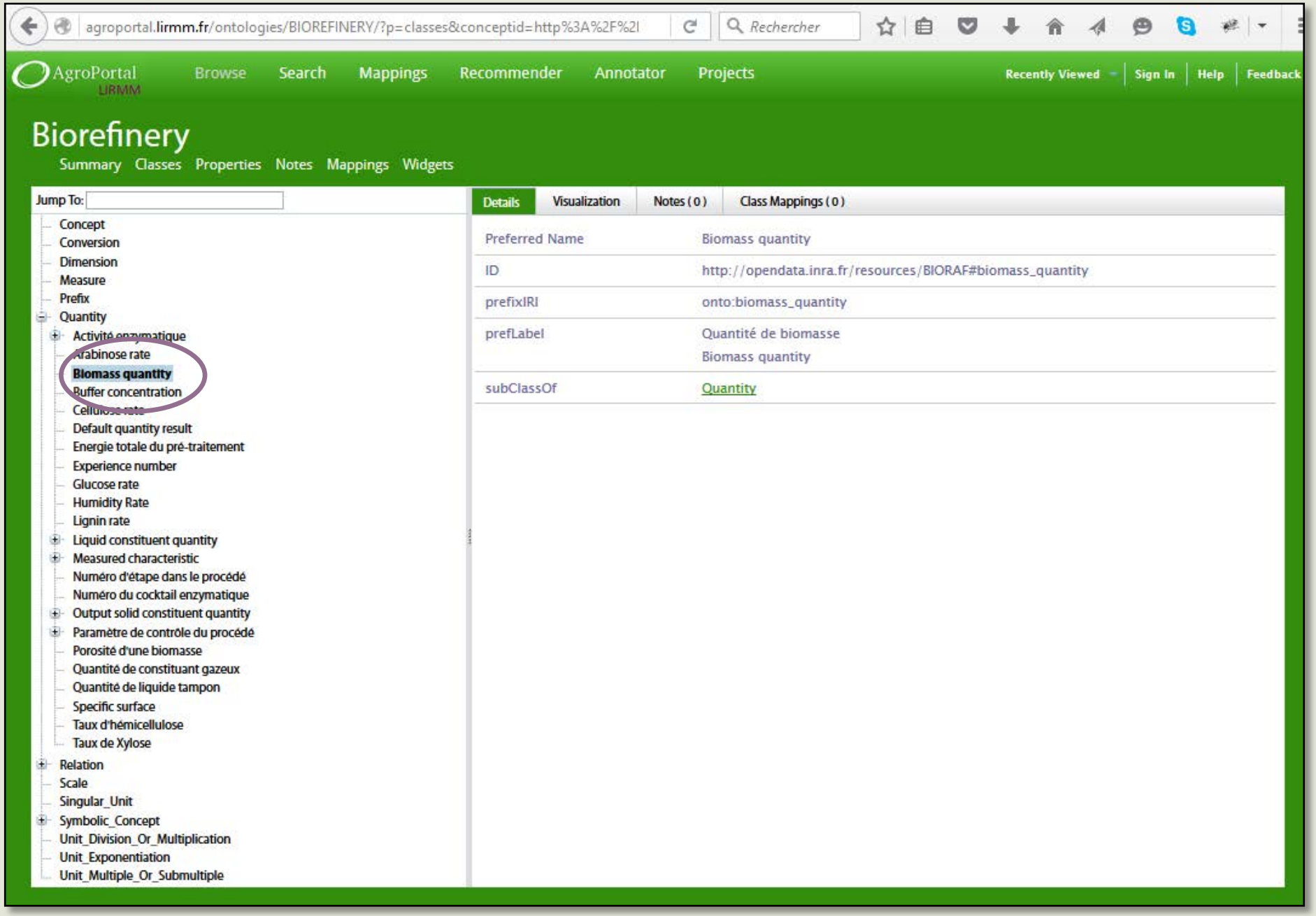
- 2. Submission description



Format OWL



Format SKOS


agroportal.lirmm.fr/ontologies/BIOREFINERY/?p=classes&conceptid=http%3A%2F%2I
Rechercher
AgroPortal
LIRMM
Browse
Search
Mappings
Recommender
Annotator
Projects
Recently Viewed
Sign In
Help
Feedback
Biorefinery
Summary
Classes
Properties
Notes
Mappings
Widgets
Jump To:
Concept
Conversion
Dimension
Measure
Prefix
Quantity
Activité enzymatique
Arabinose rate
Biomass quantity
Buffer concentration
Cellulose rate
Default quantity result
Energie totale du pré-traitement
Experience number
Glucose rate
Humidity Rate
Lignin rate
Liquid constituent quantity
Measured characteristic
Numéro d'étape dans le procédé
Numéro du cocktail enzymatique
Output solid constituent quantity
Paramètre de contrôle du procédé
Porosité d'une biomasse
Quantité de constituant gazeux
Quantité de liquide tampon
Specific surface
Taux d'hémicellulose
Taux de Xylose
Relation
Scale
Singular_Unit
Symbolic_Concept
Unit_Division_Or_Multiplication
Unit_Exponentiation
Unit_Multiple_Or_Submultiple
Details
Visualization
Notes (0)
Class Mappings (0)
Preferred Name
Biomass quantity
ID
http://opendata.inra.fr/resources/BIORAF#biomass_quantity
prefixIRI
onto:biomass_quantity
prefLabel
Quantité de biomasse
Biomass quantity
subClassOf
Quantity

Community based functionalities

Latest Mappings

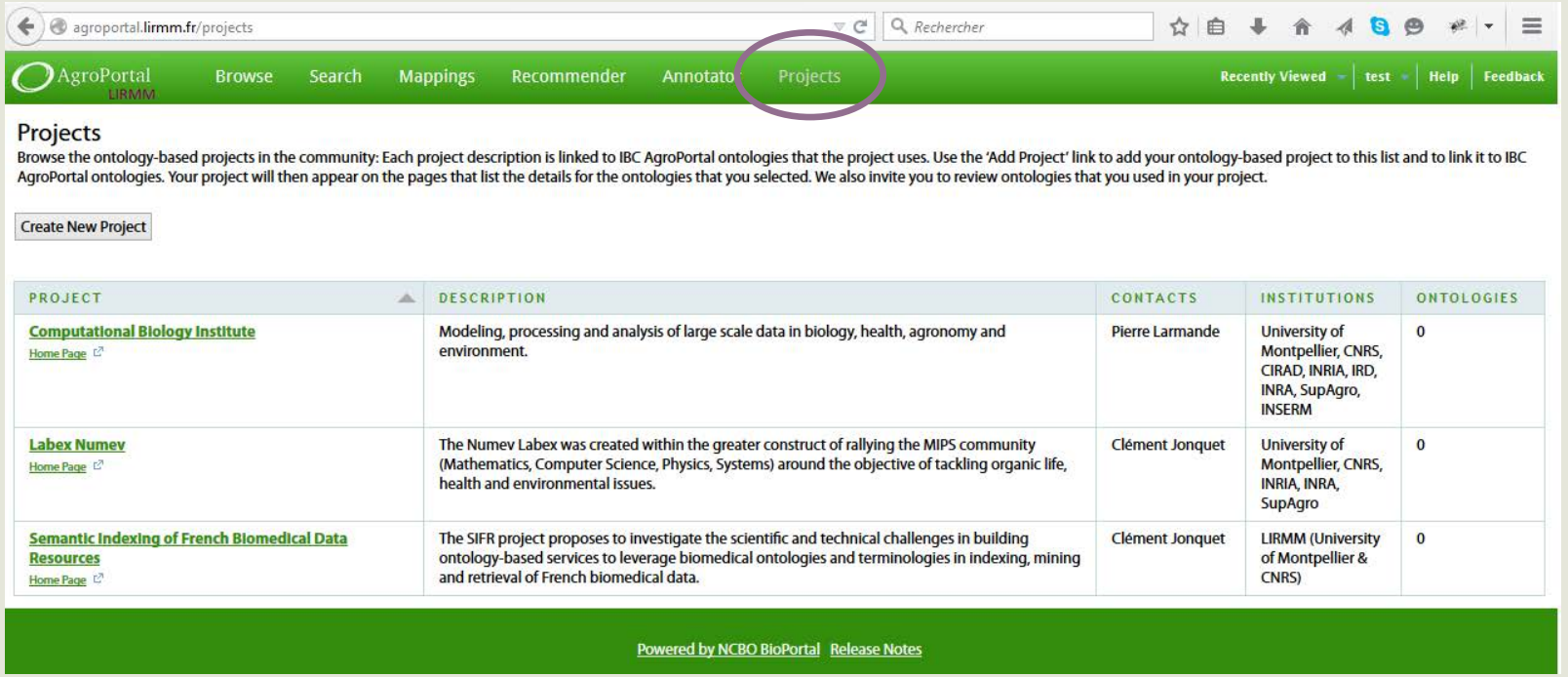
tissue (BT) <=> tissue (CL)
REST Mapping 06/24/2015 by jonquet

tissue (CL) <=> tissue (BT)
REST Mapping 06/24/2015 by jonquet

Latest Notes

object quality (Phenotypic Quality Ontology)
about 19 hours ago by emonet
What is the difference with object quality or process quality? To which object those this quality...

quality vs trait (Phenotypic Quality Ontology)
about 20 hours ago by jonquet
Is this ok in PATO to have 'trait' as a synomym of quality?



Use an ontology via the API

- Ontology metadata
  - http://data.agroportal.lirmm.fr/ontologies/ONTO/?apikey=**
- Ontology classes
  - http://data.agroportal.lirmm.fr/ontologies/ONTO/classes/?apikey=**


```
  acronym: "FORM",
  name: "Formation",
  summaryOnly: null,
  ontologyType: http://data.agroportal.lirmm.fr/ontology_types/ONTOLOGY,
  @id: http://data.agroportal.lirmm.fr/ontologies/FORM,
  @type: http://data.bioontology.org/metadata/Ontology,
- links: {
    submissions: http://data.agroportal.lirmm.fr/ontologies/FORM/submissions,
    properties: http://data.agroportal.lirmm.fr/ontologies/FORM/properties,
    classes: http://data.agroportal.lirmm.fr/ontologies/FORM/classes,
    single_class: http://data.agroportal.lirmm.fr/ontologies/FORM/classes/{class_id},
    roots: http://data.agroportal.lirmm.fr/ontologies/FORM/classes/roots,
    instances: http://data.agroportal.lirmm.fr/ontologies/FORM/instances,
```

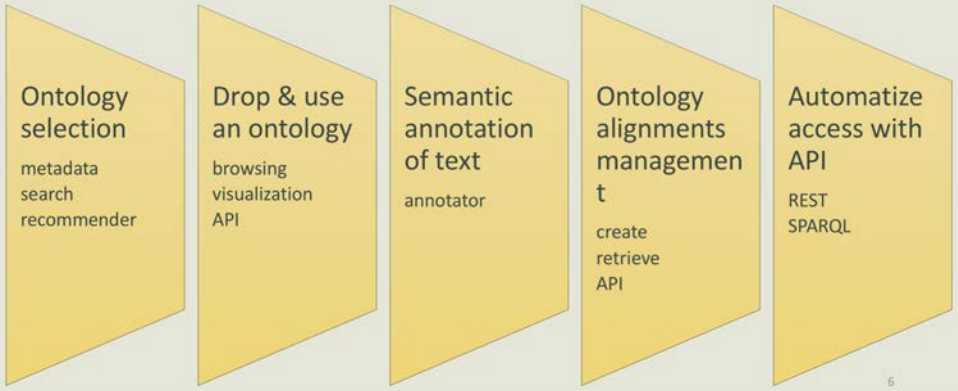

- More calls: http://data.agroportal.lirmm.fr/documentation

Your turn!

Eventually submit an ontology (if it is not already done) but it is not mandatory

For the ontology of your choice, navigate, visualize, leave some comments

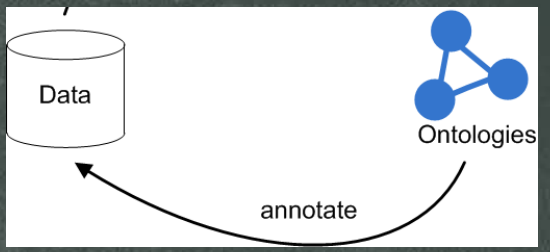
Enter a project that uses one or more ontology (s)



Semantic annotation of text

- Identify ontology concepts in text

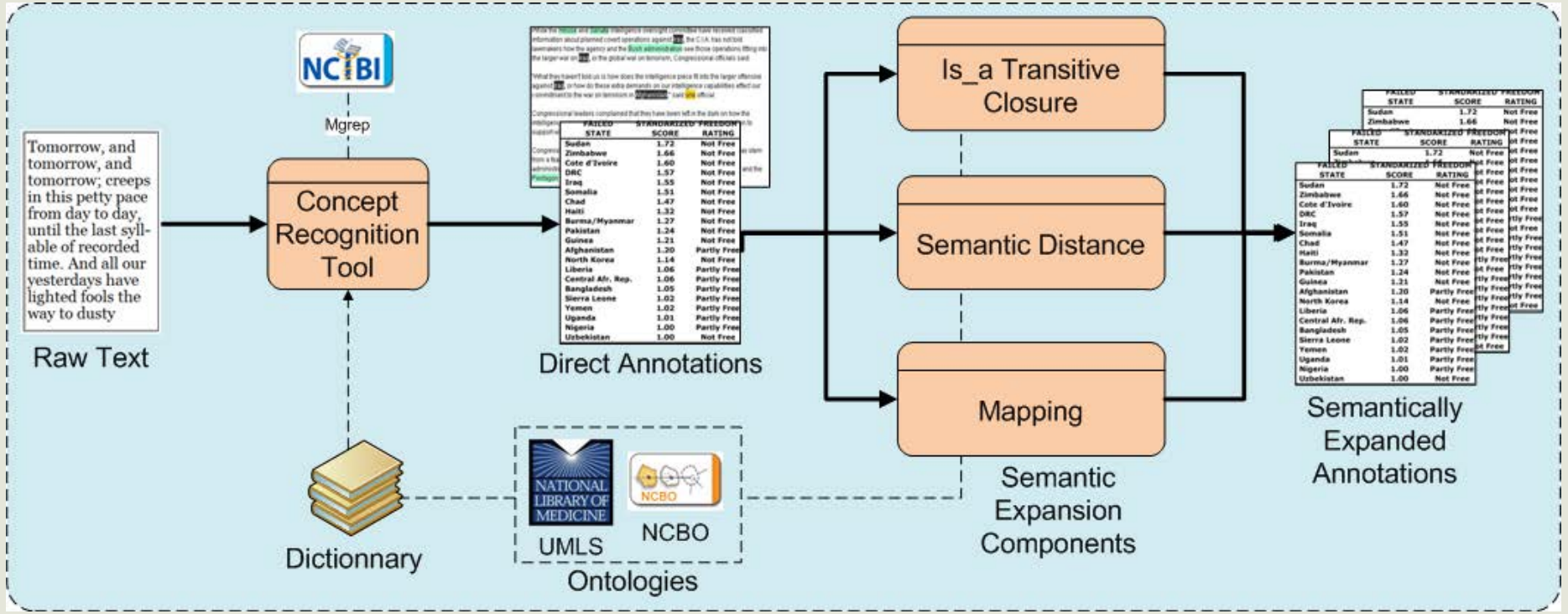
Why semantic annotation is hard?



- Annotation is not an easy task
  - Lack of annotation tools (convenient, simple to use and easily integrated into automatic processes)
  - Boring additional task without immediate reward for the user

- Automatically process a piece of raw text to annotate it with relevant ontologies
  - Large scale – to scale up for many resources and ontologies
  - Automatic – to offer good precision and recall
  - Easy to use and to access – to enlarge the possible use cases
  - Customizable – to fit very specific needs
  - Smart – to leverage the knowledge contained in ontologies
  - Evolutive – both ontologies and data change everyday

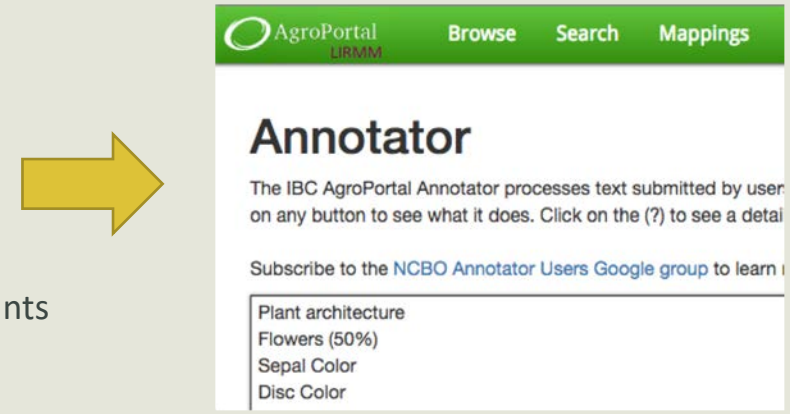
Ontology-based annotation workflow



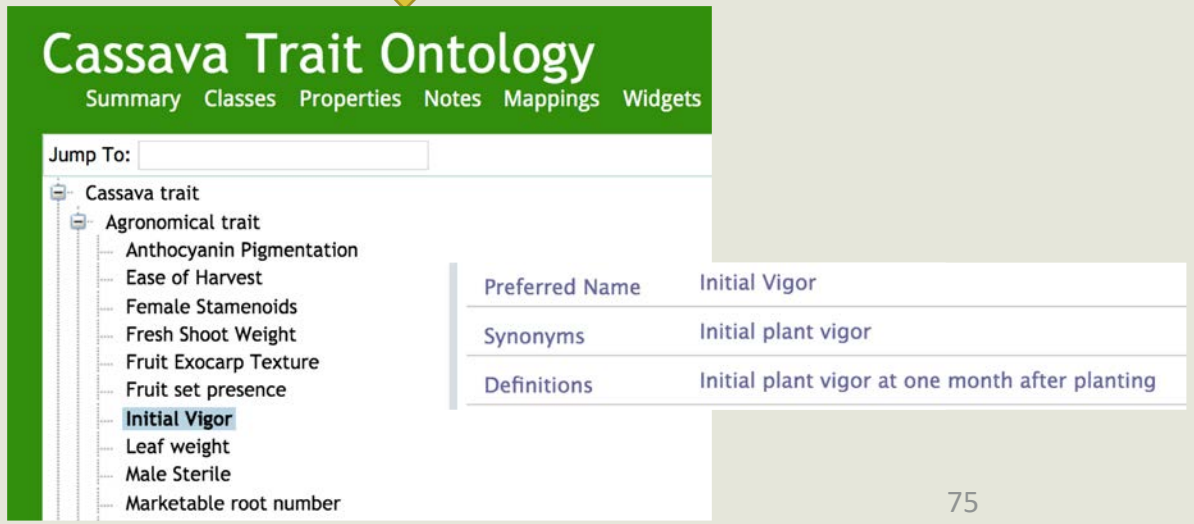
- First, direct annotations are created by recognizing concepts in raw text,
- Second, annotations are semantically expanded using knowledge of the ontologies,
- Third, all annotations are scored according to the context in which they have been created.

Sprouting
Initial Vigor
Color of unexpanded apical leaves
Color of first fully expanded leaf
Leaf vein color
Apical Pubescence
Length of stipules
Number of leaf lobes
Leaf lobe position
Angle of petiole insertion
Petiole length
Petiole color
Anthocyanin pigmentation
Growth habit of young stem
Pubescence of young stem
Stem color
Leaf scar prominence
Apical branching
Branching levels
Branching Angle
Height of first apical branch
Height of plant
Total fresh weight foliage and stems
Total fresh weight foliage and stems
Number harvested

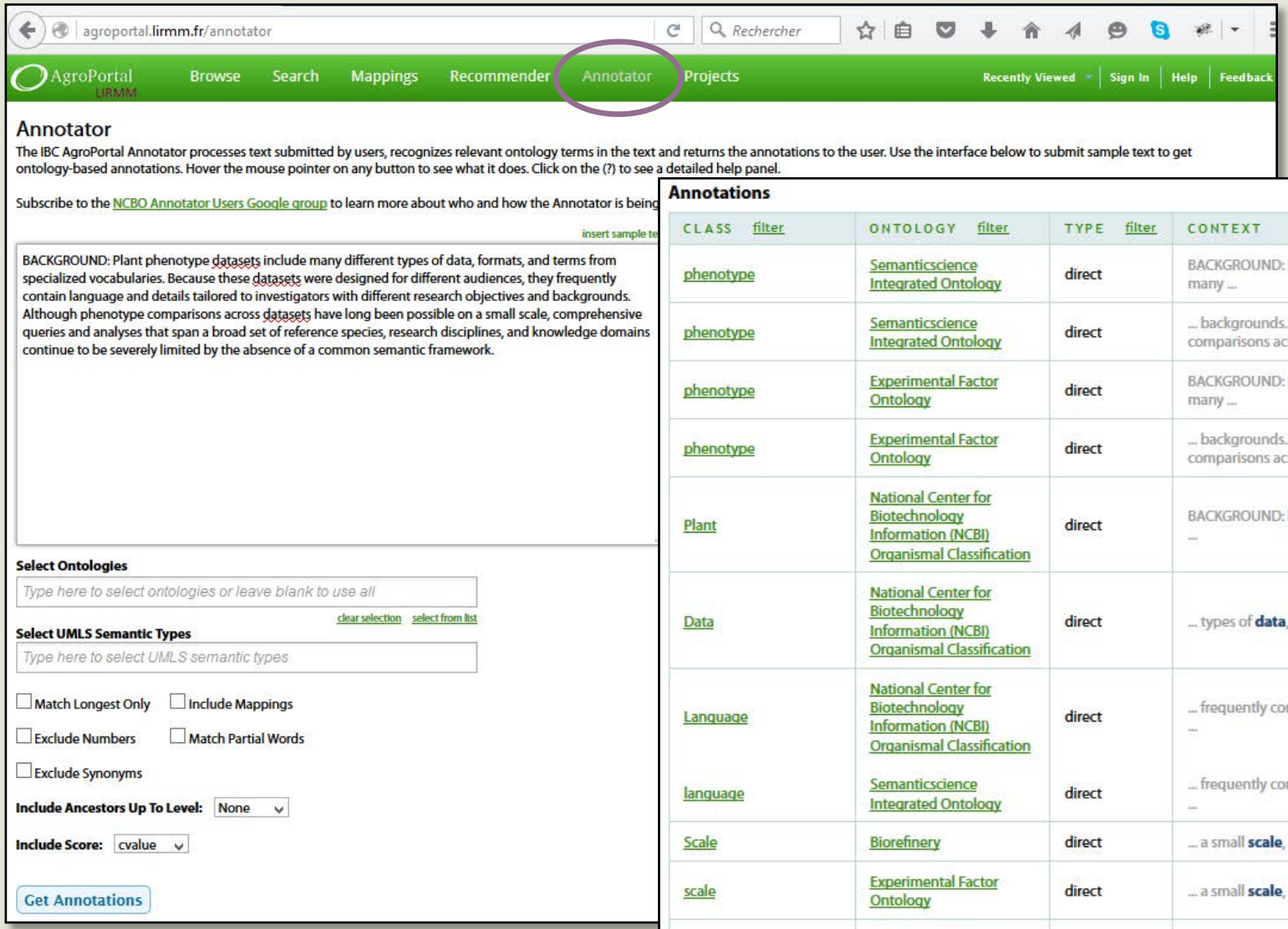
Root number
Fresh weight of storage root
Fresh root yield
Dry yield
Harvest index
Proportion of lodged plants
Leaf retention
Plant architecture
Flowers (50%)
Sepal Color
Disc Color
Sigma color
Ovary color
Anther color
Female stamenoids
Male Sterile
Days to Flower
Fruit set
Fruit Exocarp
Ploidy
Seed oclor



Cassava Trait Ontology



Annotator



Annotations

*total results **14** (direct **14** / ancestor **0** / mapping **0**)*

CLASS filter	ONTOLOGY filter	TYPE filter	CONTEXT	MATCHED CLASS filter	MATCHED ONTOLOGY filter	SCORE
phenotype	Semanticscience Integrated Ontology	direct	BACKGROUND: Plant **phenotype** datasets include many ...	phenotype	Semanticscience Integrated Ontology	4.322
phenotype	Semanticscience Integrated Ontology	direct	... backgrounds. Although **phenotype** comparisons across datasets ...	phenotype	Semanticscience Integrated Ontology	4.322
phenotype	Experimental Factor Ontology	direct	BACKGROUND: Plant **phenotype** datasets include many ...	phenotype	Experimental Factor Ontology	4.322
phenotype	Experimental Factor Ontology	direct	... backgrounds. Although **phenotype** comparisons across datasets ...	phenotype	Experimental Factor Ontology	4.322
Plant	National Center for Biotechnology Information (NCBI) Organismal Classification	direct	BACKGROUND: **Plant** phenotype datasets include ...	Plant	National Center for Biotechnology Information (NCBI) Organismal Classification	3.322
Data	National Center for Biotechnology Information (NCBI) Organismal Classification	direct	... types of **data**, formats, and terms ...	Data	National Center for Biotechnology Information (NCBI) Organismal Classification	3.322
Language	National Center for Biotechnology Information (NCBI) Organismal Classification	direct	... frequently contain **language** and details tailored ...	Language	National Center for Biotechnology Information (NCBI) Organismal Classification	3.322
language	Semanticscience Integrated Ontology	direct	... frequently contain **language** and details tailored ...	language	Semanticscience Integrated Ontology	3.322
Scale	Biorefinery	direct	... a small **scale**, comprehensive queries and ...	Scale	Biorefinery	3.322
scale	Experimental Factor Ontology	direct	... a small **scale**, comprehensive queries and ...	scale	Experimental Factor Ontology	3.322
set	Semanticscience Integrated Ontology	direct	... a broad **set** of reference species, ...	set	Semanticscience Integrated Ontology	3.322
reference	Semanticscience Integrated Ontology	direct	... set of **reference** species, research disciplines, ...	reference	Semanticscience Integrated Ontology	3.322
bract	Plant Ontology	direct	... a small **scale**, comprehensive queries and ...	bract	Plant Ontology	3.000
trichome	Plant Ontology	direct	... a small **scale**, comprehensive queries and ...	trichome	Plant Ontology	3.000

Format Results As: JSON

Retrieve the annotations

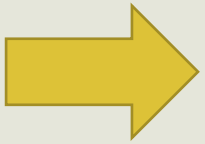
			these ...
population	Agriculture and Forestry Ontology	direct	... rapidly growing **human population**, there is a ...
population	Agriculture and Forestry Ontology	direct	... growing human **population**, there is a ...

Format Results As: JSON

To reproduce these results:

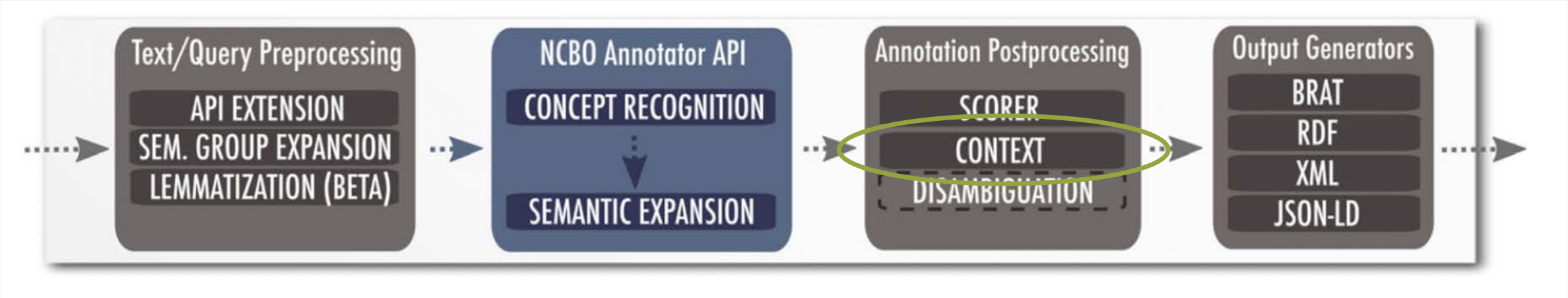
Corresponding REST web service call

Additional parameters are documented at Annotator Web Service




```
[
 - {
    - annotatedClass: {
        @id: "http://www.yso.fi/onto/yso/p6881",
        @type: "http://www.w3.org/2002/07/owl#Class"
      },
      hierarchy: [ ],
    - annotations: [
       - {
            from: 11,
            to: 18,
            matchType: "SYN",
            text: "INCREASE",
            negationContext: "AFFIRMED"
         }
      ],
      mappings: [ ],
      score: 3
  },
 - {
    - annotatedClass: {
        @id: "http://lod.nal.usda.gov/nalt/45764",
        @type: "http://www.w3.org/2002/07/owl#Class"
      },
      hierarchy: [ ],
    - annotations: [
       - {
            from: 122,
            to: 126,
            matchType: "SYN",
            text: "HUMAN",
            negationContext: "AFFIRMED"
         }
      ],
      mappings: [ ],
      score: 3
  },
 - {
    - annotatedClass: {
        @id: "http://purl.obolibrary.org/obo/NCBITaxon_9606",
        @type: "http://www.w3.org/2002/07/owl#Class"
      },
      hierarchy: [ ],
    - annotations: [
       - {
            from: 122,
            to: 126,
            matchType: "SYN",
            text: "HUMAN",
            negationContext: "AFFIRMED"
         }
```

But we did not just “translate” the Annotator



- Most of our new features are developed within a proxy
  - E.g., we can call either the AgroPortal, SIFR BioPortal or even the NCBO BioPortal Annotator and use the same code to score annotations

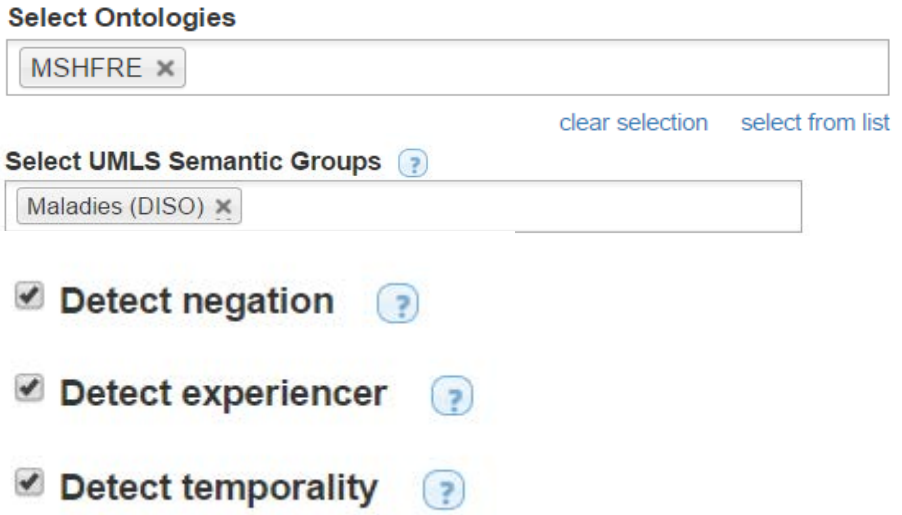
Improve the workflow to handle clinical text narrative

- Project SIFR & PractiKPharma
- Detecting Negation, Temporality and Experiencer
- Implementation using NegEx/ConText
  - Inclusion in the French/SIFR Annotator
  - Proxy architecture to plug this the NCBO Annotator
- Very good performance results
  - e.g., negation F1 between 0.8 and 0.9

A. Abdaoui, A. Tchechmedjiev, W. Digan, S. Bringay, C. Jonquet., French **ConText: a Publicly Accessible System for Detecting Negation, Temporality and Experiencer in French Clinical Notes** *Biomedical Informatics*. Under review – 3rd round.

Annotating and contextualizing clinical text

Le patient ne montre aucun signe de fièvre. Son père a déjà eu de l'arthrose. Il a des antécédents de dépression.



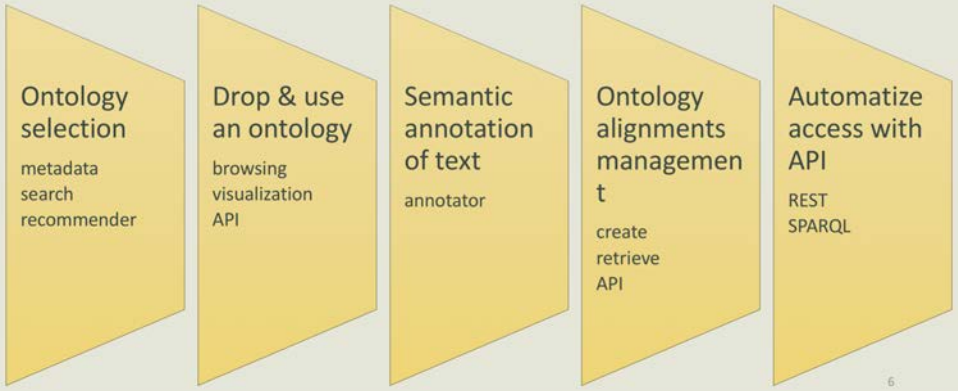
CLASS filter	ONTOLOGY filter	TYPE filter	UMLS SEM TYPE	CONTEXT	MATCHED CLASS filter	MATCHED ONTOLOGY filter	NEGATION	EXPERIENCER	TEMPORALITY
Fièvre	Medical Subject Headings, version francaise	direct		... signe de **fièvre**. Son père a ...	Fièvre	Medical Subject Headings, version francaise	NEGATED	PATIENT	RECENT
Arthrose	Medical Subject Headings, version francaise	direct		... eu de l'**arthrose**. Il a des ...	Arthrose	Medical Subject Headings, version francaise	AFFIRMED	OTHER	RECENT
Dépression	Medical Subject Headings, version francaise	direct		... antécédents de **dépression**.	Dépression	Medical Subject Headings, version francaise	AFFIRMED	PATIENT	HISTORICAL

Your turn!

Take a summary of your last article and get annotations

Test the score and other advance parameters

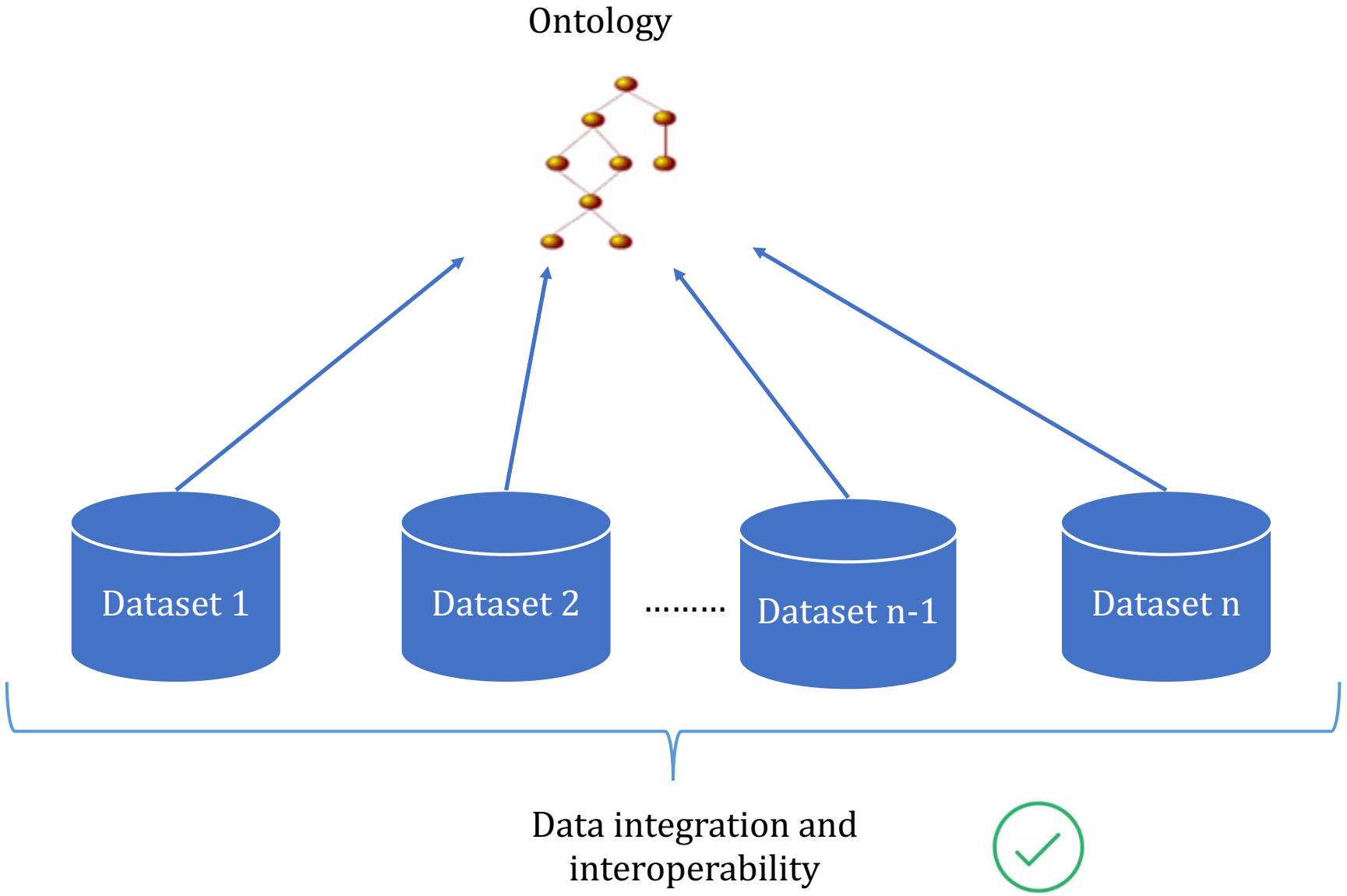
Get same results with the API



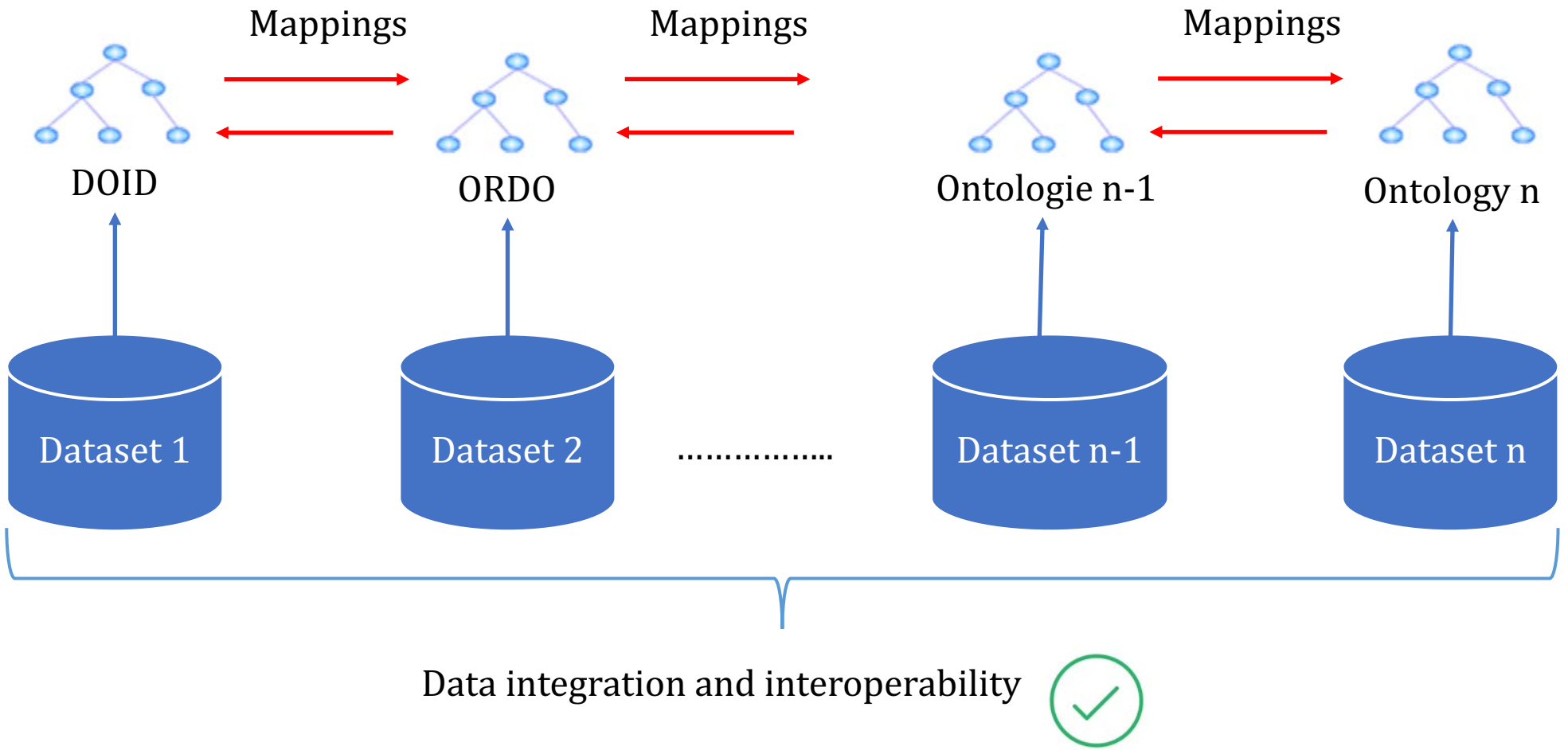
Ontology alignments management

- Retrieve or enter alignments
- Format of alignments
- Import alignments generated with external tools

Differences between theory…



… and reality.

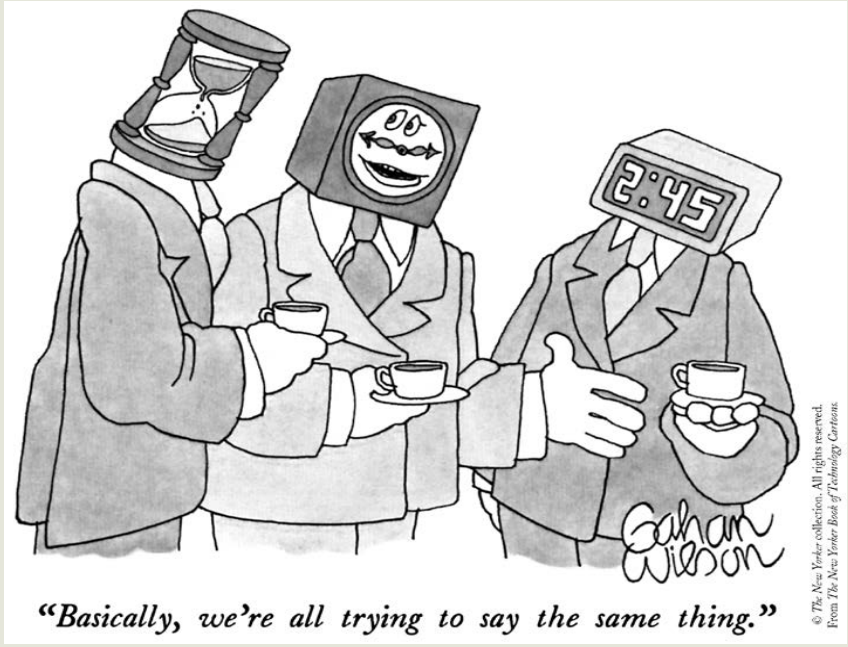

Mappings
Mappings
Mappings
DOID
ORDO
Ontologie n-1
Ontology n
Dataset 1
Dataset 2
……
Dataset n-1
Dataset n
Data integration and interoperability

Ontology alignment

- Ontologies, vocabularies, and terminologies inevitably overlap in coverage

- Mappings do not always belong to an ontology
  - The community needs a place to store and retrieve them
  - That's the role of the ontology repository

- Dealing with mappings is a technical, data and scientific challenge
  - Capture the whole mapping lifecycle
  - Semantically described with plenty of provenance information

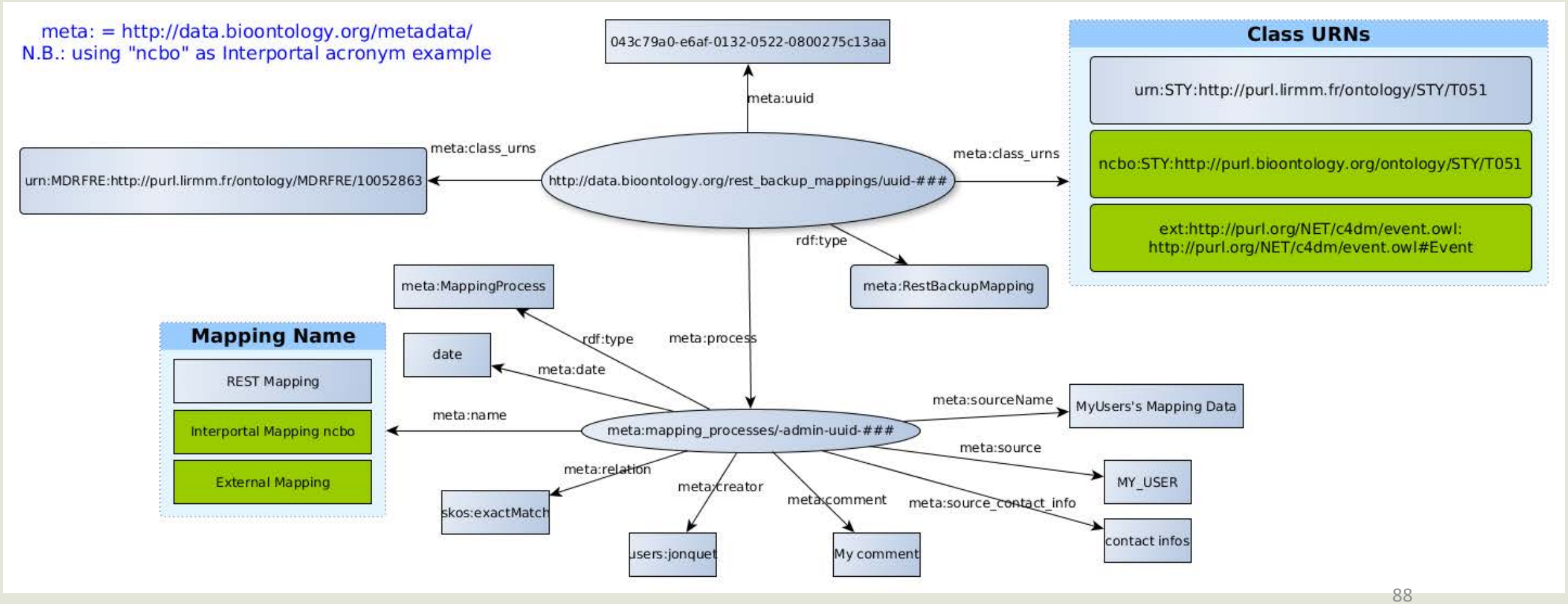


All aspects of ontology alignments

Different types of mappings

- Mappings uploaded (and stored within the portal)
  - *RestBackupMapping* - A mapping added by a user using the REST API (or the UI).
  - Materialized into the triple-store.
- Mappings created (automatically by the portal)
  - *SameURI* - Created between 2 concepts with the same URI.
  - *LOOM* - Lexical mappings created between 2 concepts with equivalent labels (preferred name): removing accents, spaces and special characters.
  - *CUI* - Created between 2 concepts that have the same CUI (Concept Unique Identifiers). The CUI is an unique identifier used by UMLS.
  - Not materialized in the triple-store, generated on-the-fly.

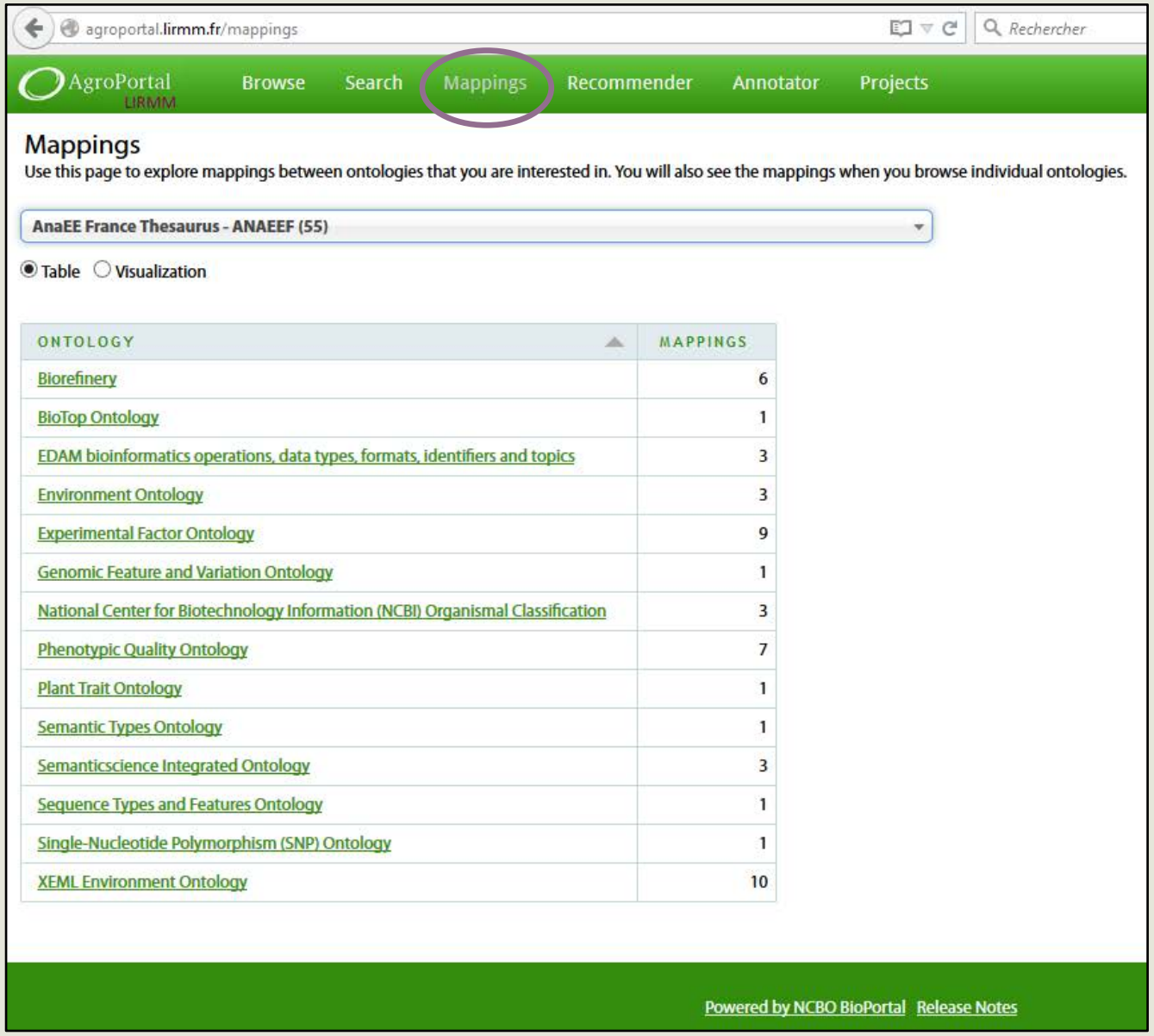
Representation of mappings inside AgroPortal



Example with translation mappings

- Mappings between 2 ontologies hosted in different « bioportal » instances
- Tagged with different mapping properties

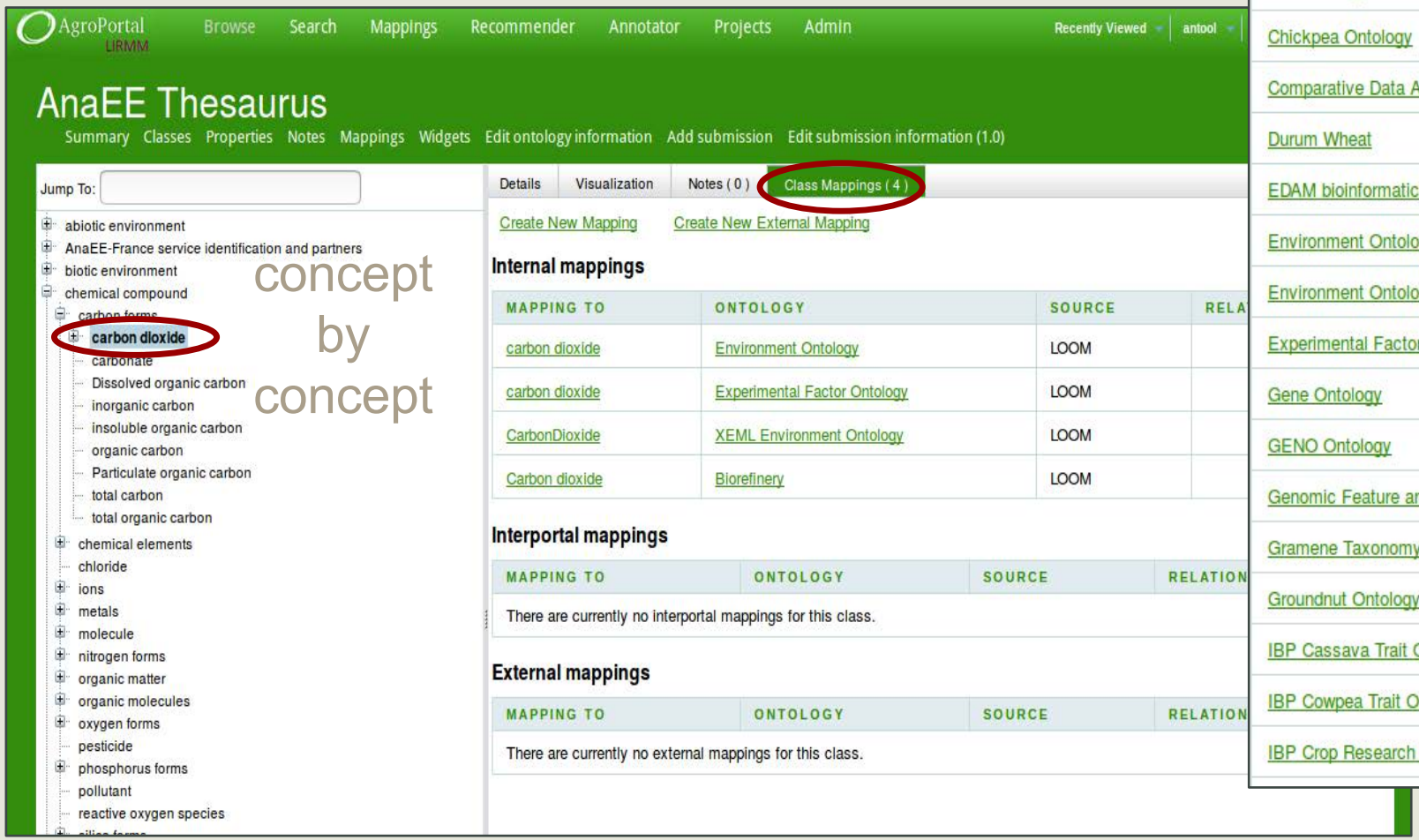

```
{"creator":"http://data.stageportal.lirmm.fr/users/AAmina" ,
 "source_contact_info":"a_annane@esi.dz",
 "relation" : ["http://www.w3.org/2004/02/skos/core#exactMatch",
               "http://purl.org/linguistics/gold/freeTranslation"],
 "source":"REST",
 "source_name":"Reconciliation of multilingual mapping",
 "comment" : "Multilingual mapping",
 "classes" : { "http://chu-rouen.fr/cismef/SNOMED_int.#A-01020" : "SNMIFRE",
         "http://purl.bioontology.org/ontology/SNMI/A-01020" : "ncbo:SNMI"}}
```



- When browsing an ontology, one can retrieve mappings for the whole ontology hosted in the repository

- When browsing a concept, one can retrieve mappings for this specific concept

Alignments in AgroPortal

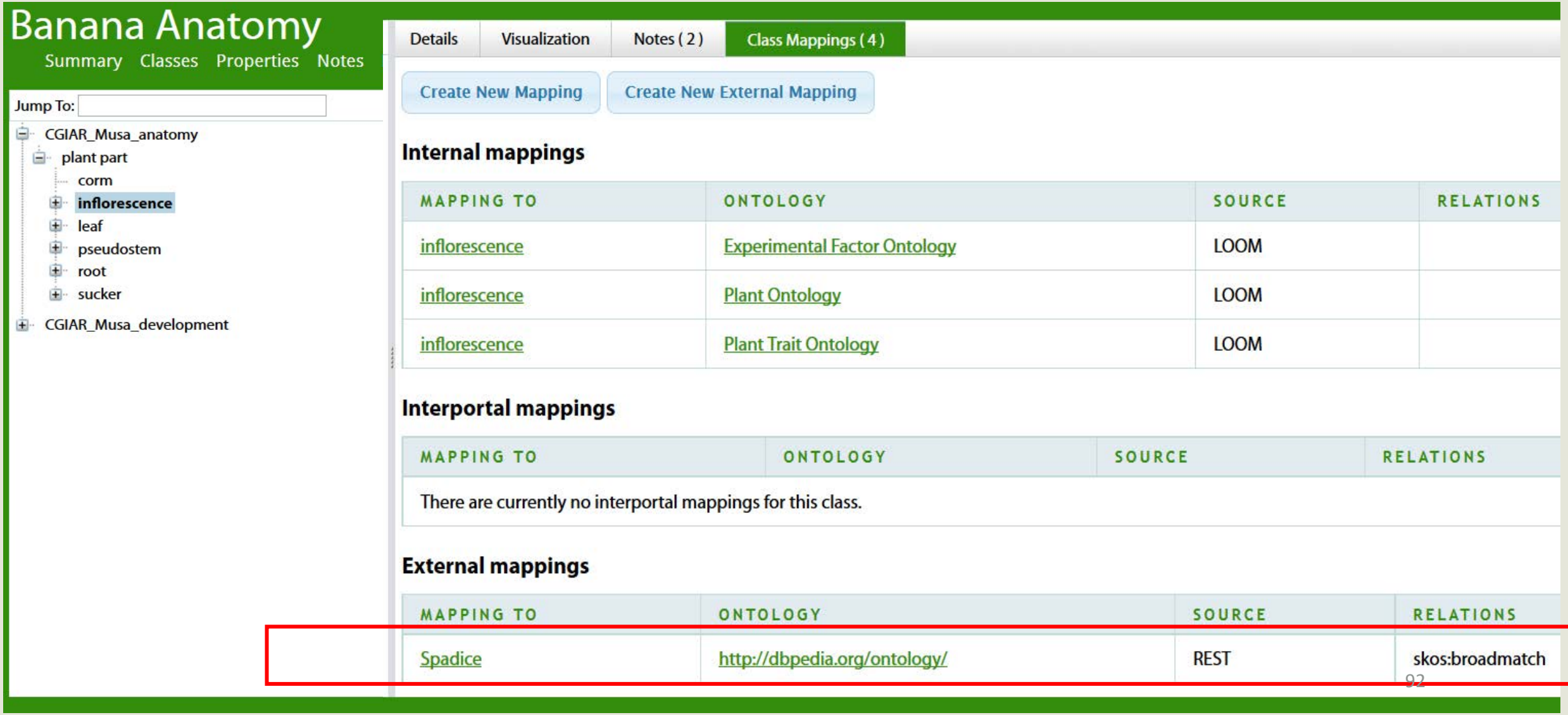


Mappings

ONTOLOGY	MAPPINGS
Agri-Food Experiment Ontology	1
Agricultural Experiments Ontology	5
Banana Anatomy	2
Basic Formal Ontology	1
Biorefinery	13
Cell Ontology	4
Chickpea Ontology	14
Comparative Data Analysis Ontology	3
Durum Wheat	2
EDAM bioinformatics operations, data types, formats, identifiers and topics	25
Environment Ontology	72
Environment Ontology for Livestock	10
Experimental Factor Ontology	93
Gene Ontology	5
GENO Ontology	5
Genomic Feature and Variation Ontology	5
Gramene Taxonomy Ontology	3
Groundnut Ontology	16
IBP Cassava Trait Ontology	23
IBP Cowpea Trait Ontology	25
IBP Crop Research Ontology	22

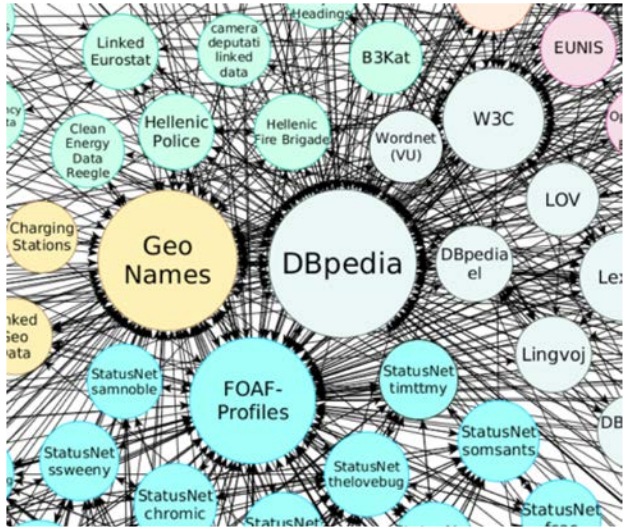
Enable to store external mappings

i.e., mappings with only one concept in AgroPortal



Mappings to external resources were also extracted

- e.g.,



AGROVOC - AGROVOC (84,030)

Table Visualization

ONTOLOGY	MAPPINGS
Agri-Food Experiment Ontology	1
Agricultural and Nutrition Technology Ontology	2
Agriculture and Forestry Ontology	22
AGRORDF	2
AnaEE Thesaurus	333
Animal Disease Ontology	17
Animal Trait Ontology for Livestock	3
Biodiversity Thesaurus	255
Biological Collections Ontology	1
Biorefinery	2
Brachiaria Ontology	1
Brassica Ontology	2
Cassava Trait Ontology	1
Castor Bean Ontology	1
Cell Ontology	19
Chickpea Ontology	2
Common bean Ontology	1
Cowpea Trait Ontology	1
Darwin-SW	1
EDAM bioinformatics operations, data types, formats, identifiers and topics	6
Environment Ontology	29
Experimental Factor Ontology	85
External Mappings	47,809
Flora Phenotype Ontology	5
FoodOn	192

What to do now: analysis and feedback to community to improve the dataset

Mappings entre ontologies: a few exemples

- http://agroportal.lirmm.fr/ontologies/STY?p=classes&conceptid=http%3A%2F%2Fpurl.bioontology.org%2Fontology%2FSTY%2FT002#mappings

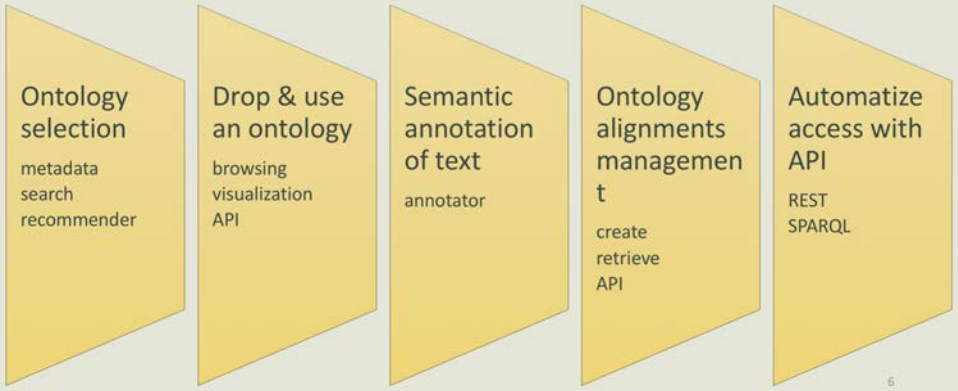
- http://bioportal.lirmm.fr/ontologies/MSHFRE/?p=classes&conceptid=http%3A%2F%2Fpurl.lirmm.fr%2Fontology%2FMSHFRE%2FD012959

Your turn!

Retrieve all the alignments generated by the portal for your favorite ontology

Enter (relevant) alignments between classes of different ontologies

Enter alignments to classes that are not in portal e.g., DBPedia (AgroPortal only)

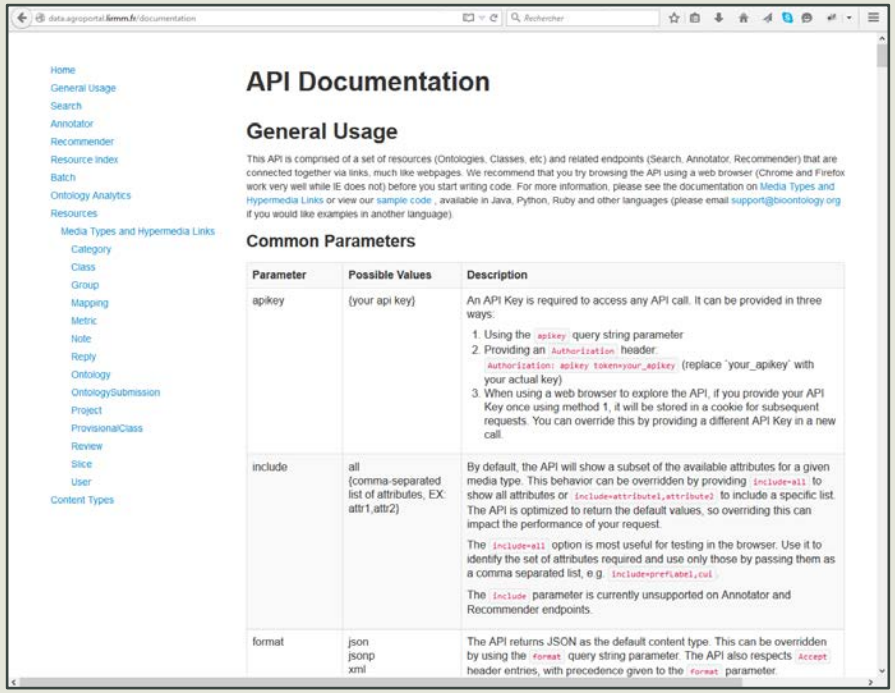


Automatize access with API

- REST
- SPARQL

REST Web Service API:

http://data.agroportal.lirmm.fr/documentation

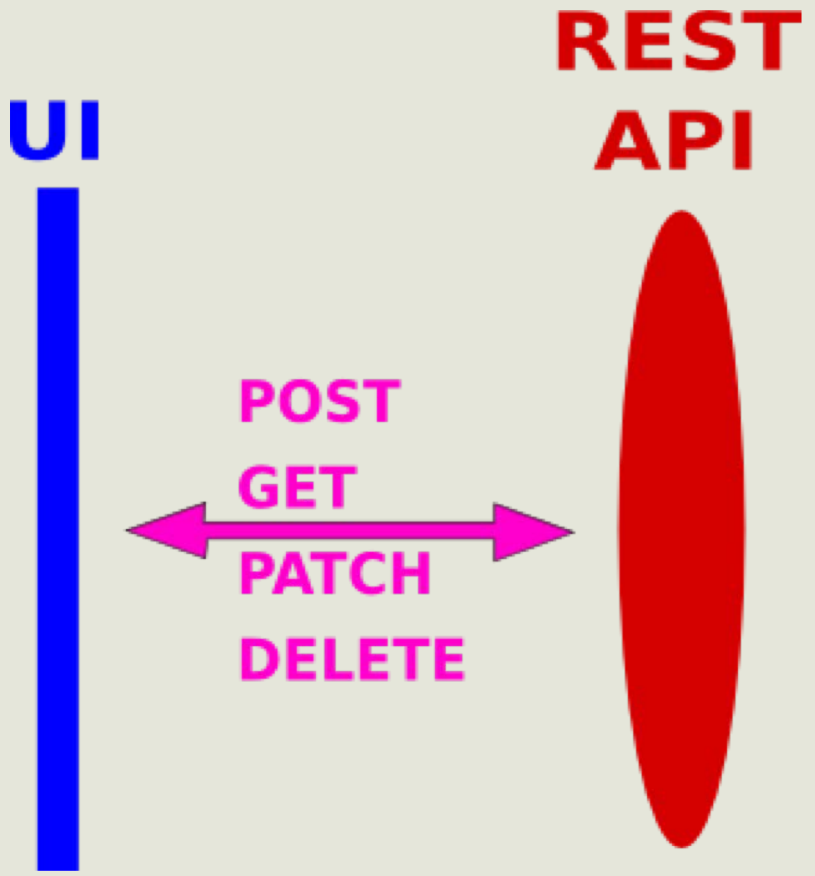


SPARQL endpoint:

http://sparql.agroportal.lirmm.fr

What's a REST API?

- Uses HTTP protocol to access web resource
- Access to a resource via its URL
- Native HTTP operations:
  - GET (retrieve a resource)
  - POST/PUT (create)
  - PATCH (modify)
  - DELETE (delete)



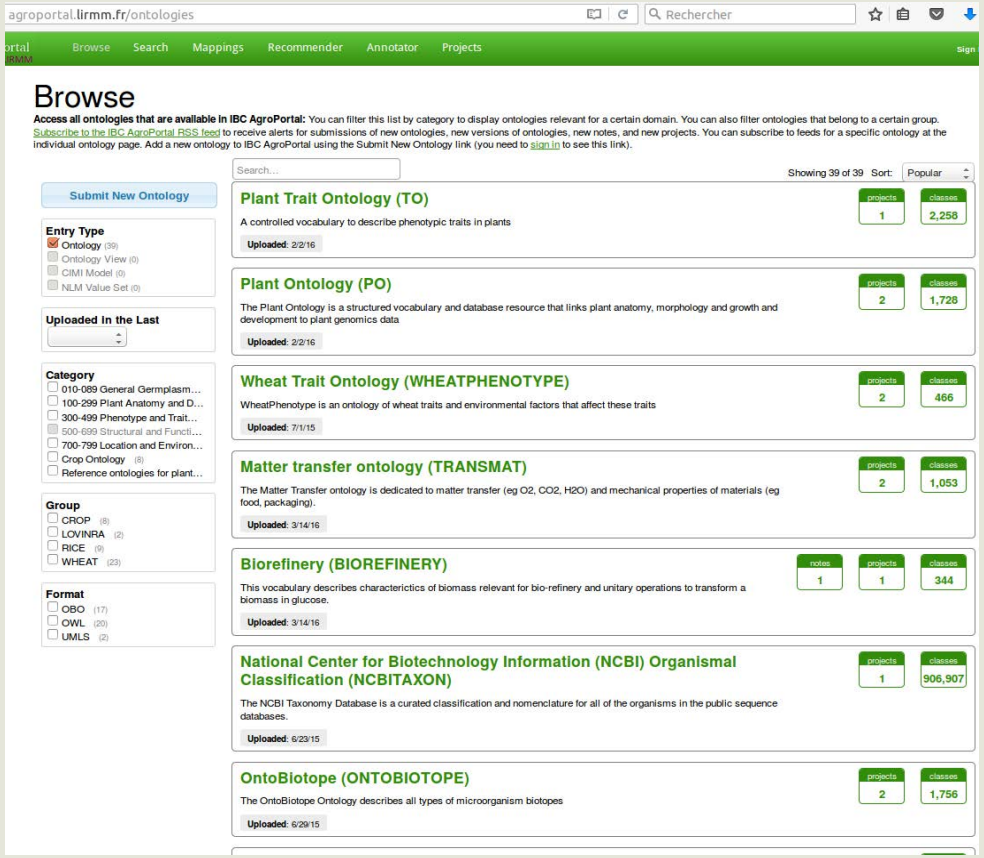
BioPortal/AgroPortal/EcoPortal REST API

- Data are exposed in JSON or XML with the following base URLs:
  - http://data.agroportal.lirmm.fr/
  - http://data.bioontology.org/
  - http://193.204.79.110:8080 (for EcoPortal)

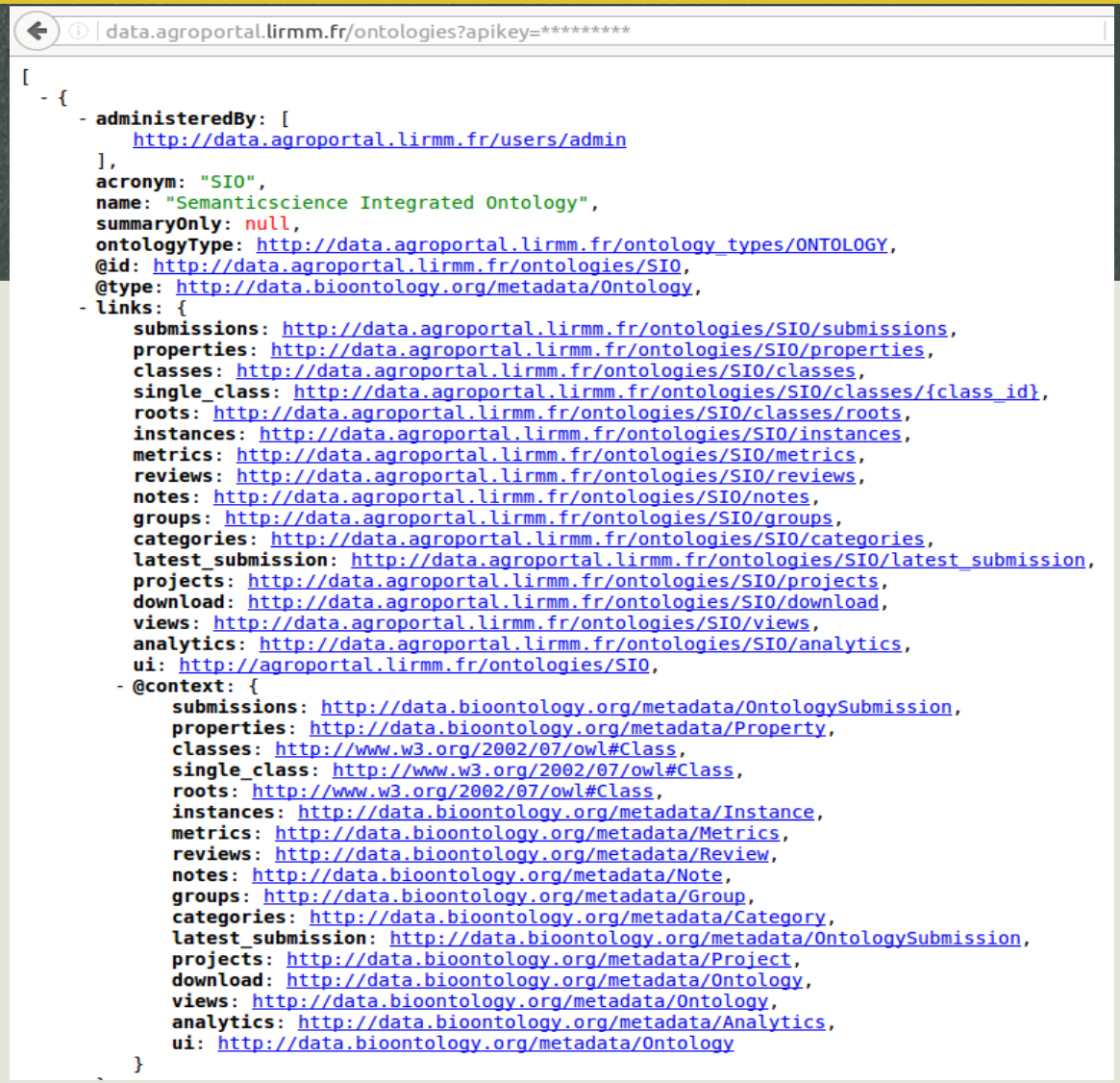
- Operations are applied on these data with HTTP queries
  - http://data.agroportal.lirmm.fr/documentation
    - GET queries retrieve objects (ontologies, classes, mappings, users, project, slice, etc.)
    - PUT queries create objects
    - PATCH queries modify objects
    - DELETE queries delete objects

- Exemple: http://data.agroportal.lirmm.fr/users?apikey=XXX&display=all

Access to data via REST API

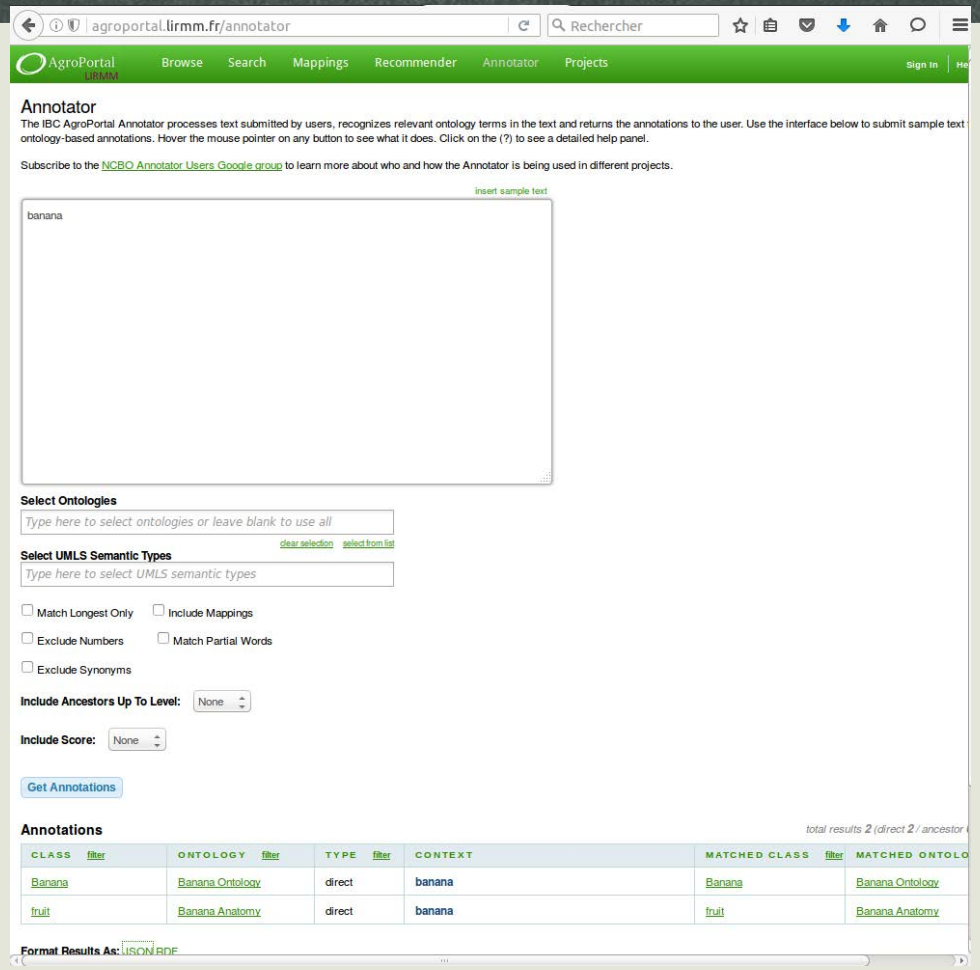


agroportal.lirmm.fr/ontologies

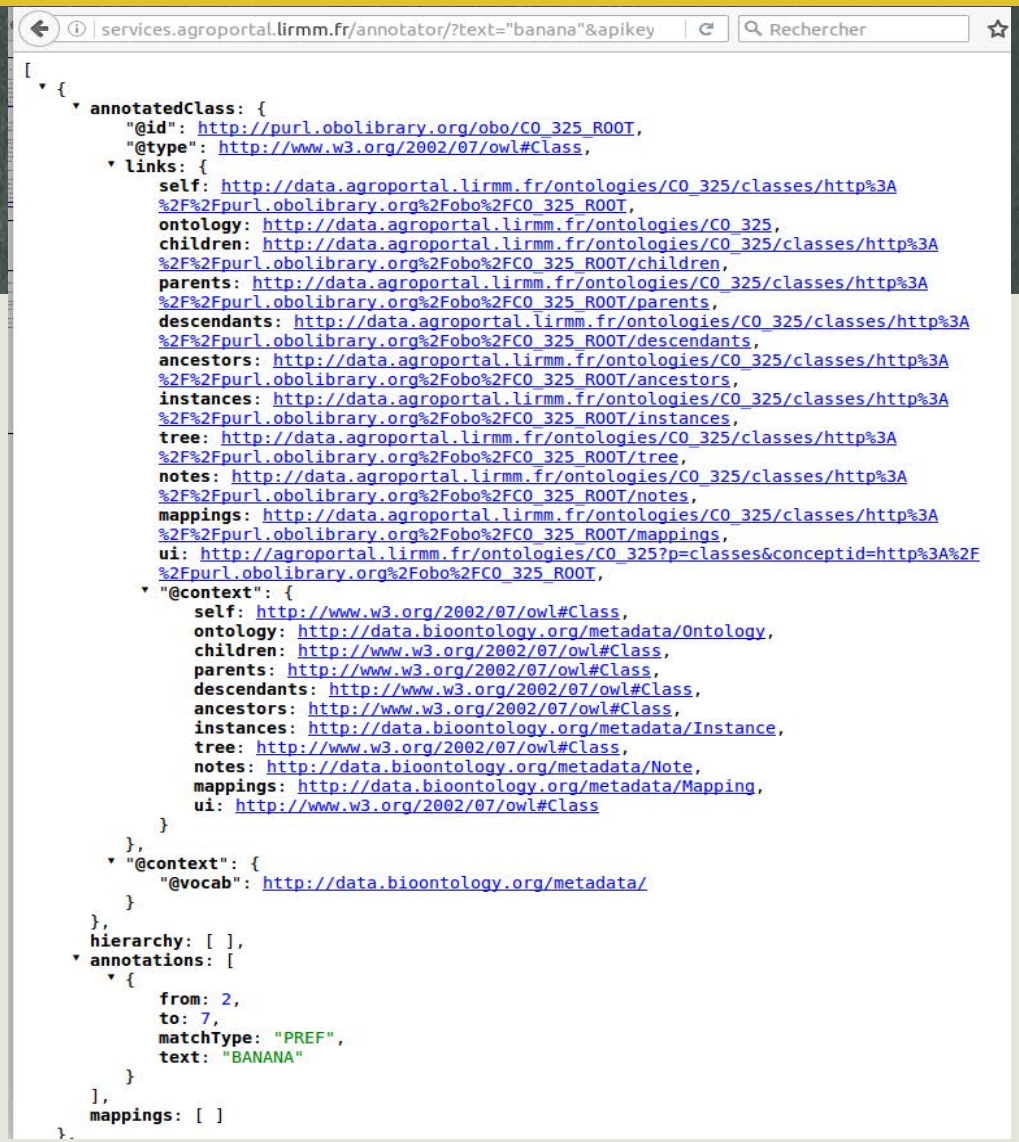


data.agroportal.lirmm.fr/ontologies?apikey=***

Access to services via REST API



agroportal.lirmm.fr/annotator



services.agroportal.lirmm.fr/annotator/?text="banana"&apikey=***

Examples of REST calls

- Get information about a user
  - http://data.agroportal.lirmm.fr/users/jonquet
- Get information about a group
  - http://data.agroportal.lirmm.fr/groups/LOVINRA
- Retrieve information about an ontology
  - http://data.agroportal.lirmm.fr/ontologies/CO_125
- Get information about a project
  - http://data.agroportal.lirmm.fr/projects/SIFR

Examples of REST calls for mappings

- Retrieve a specific mapping by id
  - http://data.agroportal.lirmm.fr/mappings/fd709e40-fcab-0132-77e3-525400026749
- Retrieve mappings btw 2 ontologies
  - http://data.agroportal.lirmm.fr/mappings?ontologies=BT,CL
- Get all the mappings for a given ontology
  - http://data.agroportal.lirmm.fr/ontologies/CL/mappings
- Get all the mappings of a given class
  - http://data.agroportal.lirmm.fr/ontologies/CL/classes/http%3A%2F%2Fpurl.obolibrary.org%2Fobo%2FUBERON_0000479/mappings

Examples of SPARQL queries (1/2)

```
// all triples about ontologies

SELECT ?s ?p ?o WHERE {
  GRAPH
<http://data.bioontology.org/ontologies/ANAEETHES/submis
sions/3>{
            ?s ?p ?o .
}}
LIMIT 30
```

```
// list of all username

PREFIX meta: <http://data.bioontology.org/metadata/>

SELECT DISTINCT ?user WHERE {
  GRAPH <http://data.bioontology.org/metadata/User> {
            ?user meta:username ?o .
}}
```

```
//liste des graphes dans 4stores

SELECT DISTINCT ?g WHERE {
 GRAPH ?g {
             ?s a ?p .
}}
```

Examples of SPARQL queries (2/2)

```
//Get 20 first concept labels from the ANAETHES thesaurus.

PREFIX skos: <http://www.w3.org/2004/02/skos/core#>

SELECT DISTINCT ?s ?label WHERE {
  GRAPH
<http://data.bioontology.org/ontologies/ANAEETHES/submissions/3> {
                ?s a skos:Concept .
                ?s skos:prefLabel ?label .
}
}
ORDER BY DESC(?label)
LIMIT 20
```

Your turn!

Fire a few REST calls

… and SPARQL queries

Voilà, it’s the end

- Questions & remarks
- Feedback
- Exchanges

Thank you!

jonquet@lirmm.fr