# ICBO 2020

## Ontology-based classification of radiological procedures for consistent sharing in Clinical Data Warehouses

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# Context, Goals

- Improving our Clinical Data Warehouse « eHop » to handle imaging data
- Considering artificial intelligence or data mining study cases
  - We chose to align our imaging data with an ontology of medical imaging procedures

# Context : RadLex ontology

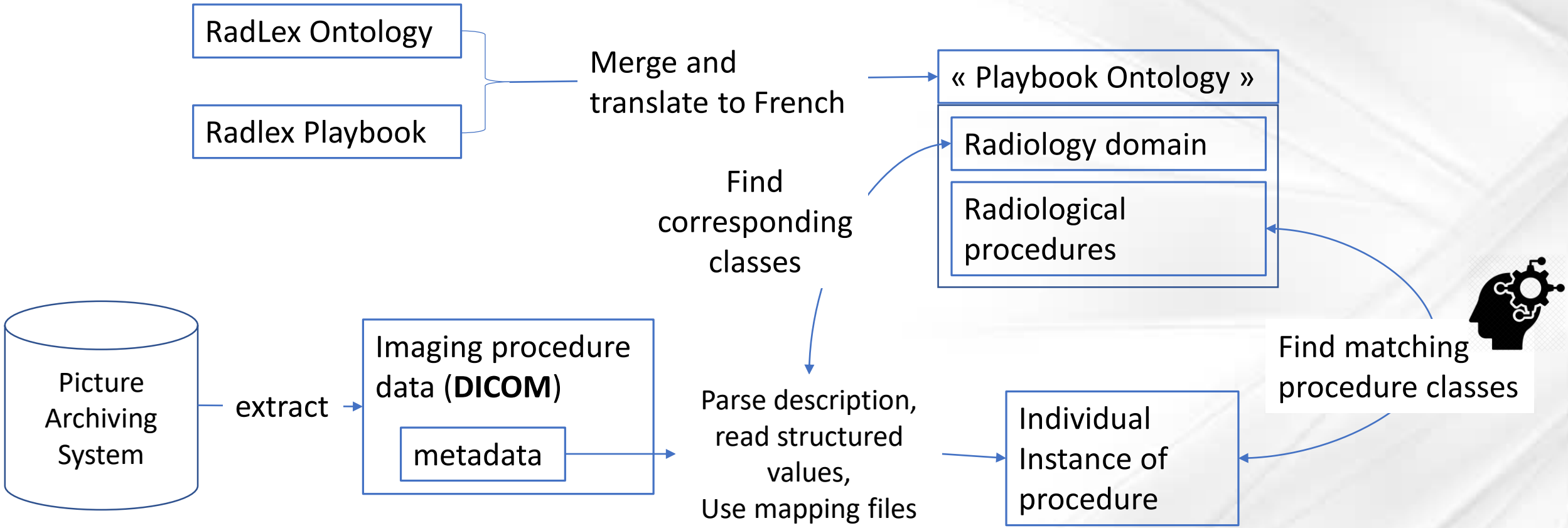
- Produced by the Radiological Society of North America (RSNA)
- Started in 2005, Including more than 30,000 terms covering the whole domain of radiology
- Every class has a RID (Radlex ID)
- Is avaible in OWL format

# Context : The RadLex Playbook

- A CSV file defining more than 4400 procedures identified by a unique RadLex Playbook ID (RPID)
- Text fields manually and automatically filled in

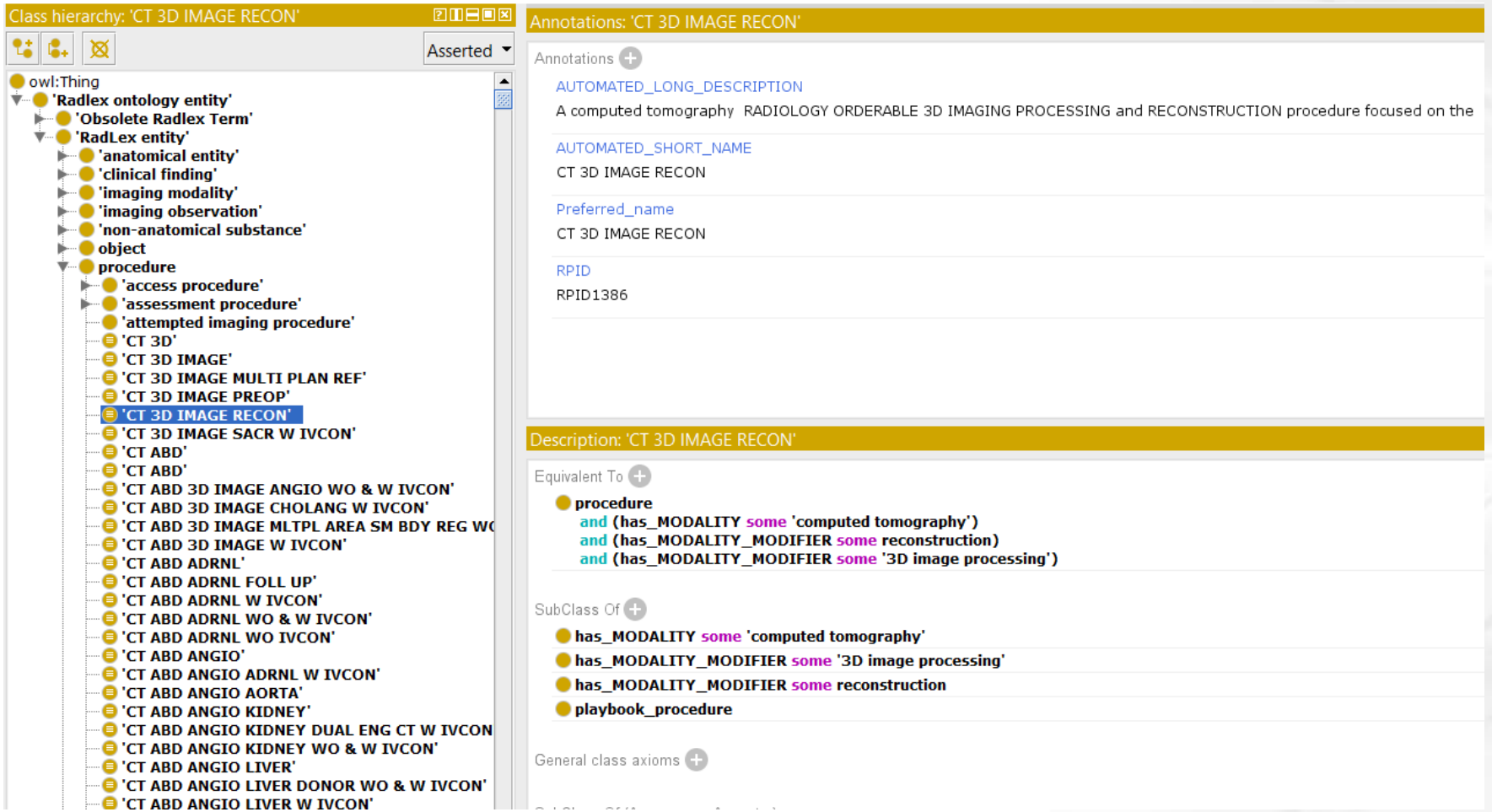
| RPID | SHORT_NAME | AUTOMATED_SHORT_NAME | MODALITY | BODY_REGION | MODALITY_MODIFIER | ANATOMIC_FOCUS | RIDS |
|---|---|---|---|---|---|---|---|
| RPID2599 | | XRAY LE 1-2VWS ANKLE BILAT | XR | LOWER EXTREMITY | 1 - 2 VIEWS | ANKLE | RID10345\|RID13060\|0\|RID2638\|0\|0\|0 |
| RPID2600 | XR Ankle 1-2V | XRAY LE 1-2VWS ANKLE | XR | LOWER EXTREMITY | 1 - 2 VIEWS | ANKLE | RID10345\|RID13060\|0\|RID2638\|0\|0\|0 |
| RPID2601 | | XRAY GUIDE MAJ JNT ASP | XR | | GUIDANCE | MAJOR JOINT | RID10345\|RID13060\|0\|0\|0\|0\|0\|0\|RID |

# Context : Our approach



# Method : Creating our Playbook Ontology

- Merge the playbook in the Radlex Ontology



# Method : Creating our Playbook Ontology

- Translate the properties into French

Annotations

rdfs:label [language: en]
RID10312

Acronym [language: en]
MRI

Definition
Non-invasive method of demonstrating internal anatomy based on the principle into computerized images. The concept includes proton spin tomographic techn

Preferred_name [language: en]
magnetic resonance imaging

Preferred_name_German [language: de]
Magnetresonanztomographie

Source
Playbook

Synonym [language: en]
MR imaging

Synonym [language: en]
MR

UMLS_ID
C0024485
UMLS_Term
MRI



Annotations

Acronym [language: en]
MRI

Definition
Non-invasive method of demonstrating internal anatomy based on the into computerized images. The concept includes proton spin tomograp

Preferred_name [language: en]
magnetic resonance imaging

Preferred_name_German [language: de]
Magnetresonanztomographie

Source
Playbook

Synonym [language: en]
MR

Synonym_French
imagerie par rmn

Synonym_French
imagerie par résonance magnétique nucléaire

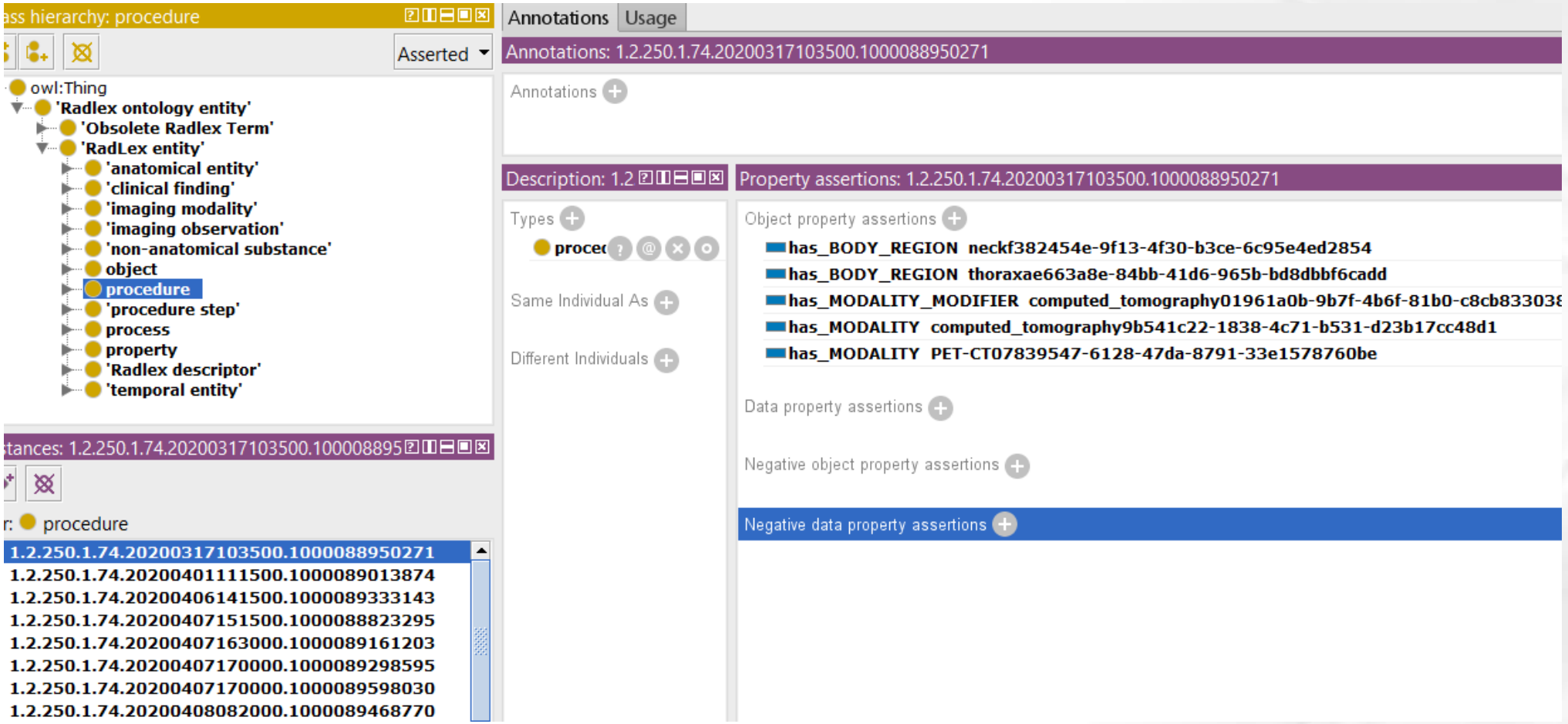
Synonym_French
imagerie par résonance magnétique

Synonym_French
irm (imagerie par résonance magnétique)

Synonym_French
irm

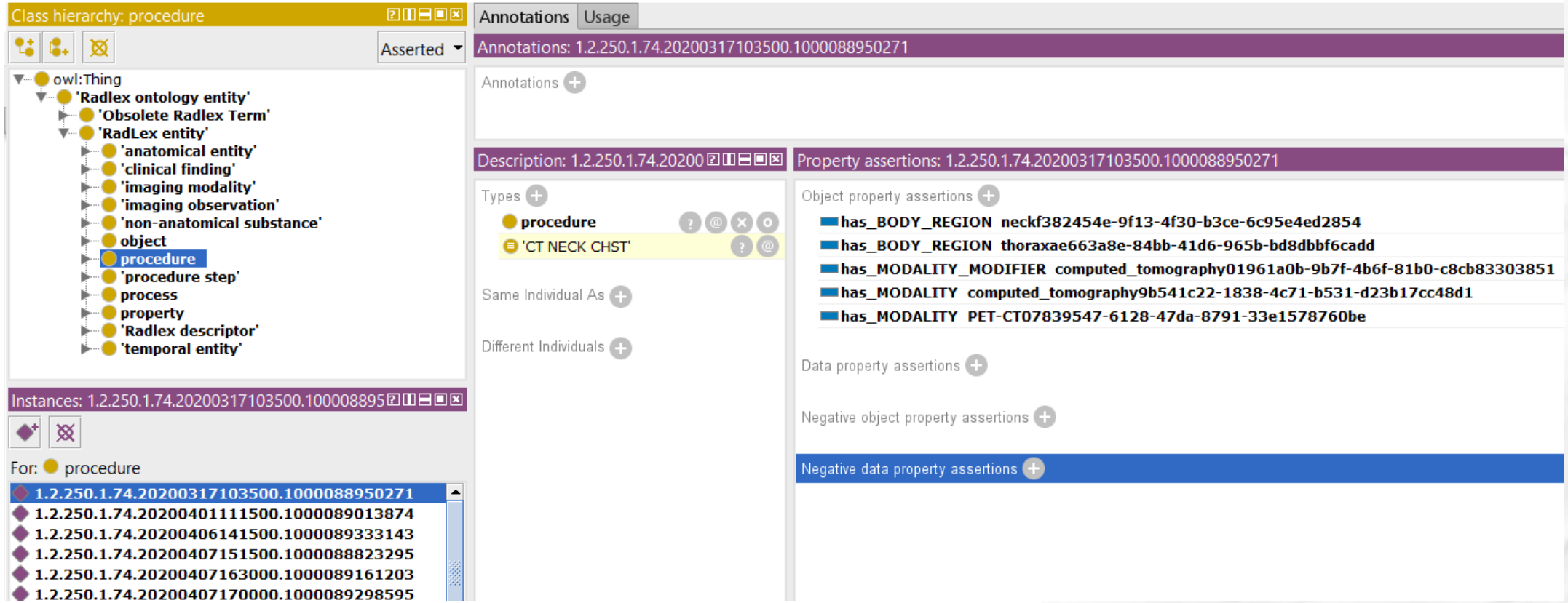
# Method : Extraction & Classification

- Create instance of ‘procedure’ from imaging data



# Method : Extraction & Classification

- Eventually, we run the reasonner to classify our instances



# Results : Classification

- We tested our solution on radiological procedures from 2 different institutions on 1 day
  - On the first one : 122 instances; on average these instances are described by more than 2 object properties. 26 were not classified.
  - On the other one : we retrieved 75 instances, described by 5 object properties on average. All instances were classified.

# Results : Classification

| our Object Property | Institution 1 | | Institution 2 | |
|---|---|---|---|---|
| | number of individuals using this object Property | number of different Radlex classes targeted by this object Property | number of individuals using this object Property | number of different Radlex classes targeted by this object Property |
| has_MODALITY | 122 | 4 | 75 | 5 |
| has_MODALITY_MODIFIER | 58 | 2 | 63 | 2 |
| has_BODY_REGION | 41 | 6 | 57 | 9 |
| has_ANATOMIC_FOCUS | 29 | 11 | 41 | 5 |
| has_REASON_FOR_EXAM | 4 | 3 | 8 | 5 |
| has_POPULATION | 4 | 1 | 2 | 1 |
| has_TECHNIQUE | 0 | 0 | 26 | 1 |

# Discussion

- The weak points of RadLex
  - Description of anatomy
  - No alignment onto foundational ontologies
  - Different modalities are covered differently in the Playbook
- The use of the DICOM standard depends on the institution
- Further validation of this work will be required and could allow for other uses

# Thank you

Our ontology is available at :
https://github.com/pierrelemordantUR1/ICBO_2020/blob/master/playbook_ontology_v7_fr.owl