Using a DL reasoner to assist SNOMED CT authoring with real-time results

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Using DL in SNOMED CT (batch mode)

• Editing the Stated form
• Request a classification
• Wait a few minutes
• Check results
  • New inferred supertypes
  • New inferred subtypes
  • Inherited attributes (distribution normal form)
  • Equivalences
Authoring challenges

• Late detection of equivalences
• Workflow disruptions
• Difficult estimation of consequences of actions
• Complex debugging of attribute inheritance on distribution normal form
• Lack of explanations for classifier inferences complicates debugging
• Learn from errors
Technological challenges

• The size of SNOMED CT has been an obstacle for implementing instant classification
  • Demands on memory, computer power
  • Write-back time

• Incremental classification availability

• Desktop vs Web based environments

• Support for branching and versioning

...new cloud based paradigms provide new possibilities
termSpace

• A web based Authoring environment for SNOMED CT Extensions
• Services oriented architecture
Supporting authors

• **Objective**: to eliminate the wait to see classification results

• Every time the concept definition is changed (Stated view)
  - All super-types are inferred
  - All sub-types are inferred
  - Equivalences are detected and reported
  - Inherited relationships are computed
  - An up-to-date ancestors graph is available
  - Entailments ”explanations” can be computed
### Colon resection (procedure)

**SCTID:** 941234567107

The ontology is consistent and satisfiable

**Equivalents (2):**
- Colectomy (procedure)
- Colon resection (procedure)

**Superclasses (2):**
- Partial excision of large intestine (procedure)
- Operation on colon (procedure)

**Subclasses (16):**
- Total colectomy (procedure)
- Sigmoidoscopy and excision of mucosa of sigmoid colon (procedure)
- Partial resection of colon (procedure)
Why Colon resection (procedure) is a subtype of Partial excision of large intestine (procedure)

Colon resection (procedure) is a subtype of Partial excision of large intestine (procedure) because:

- Colon resection (procedure) is a subtype of Procedure (procedure).
- Partial excision of large intestine (procedure) is a subtype of Procedure (procedure).
- Both Colon resection and Partial excision of large intestine have a specific method (Excision - action (qualifier value)).
- Both Colon resection and Partial excision of large intestine involve the large intestine part (body structure).
- Colon resection can be excised by a specific method, whereas Partial excision involves a larger area.

This relationship is represented graphically within the termSpace tool.
Demo real-time authoring support
Additional benefits

• Real-time *semantic queries* leveraging Description Logics

• Write a concept definition and get descendants:

```
404684003 |Clinical finding (finding)| :  
246075003 |Causative agent (attribute)| = 387458008 |Aspirin (substance)|

118669005 |Procedure on respiratory system (procedure)| : 
363704007 |Procedure site (attribute)| = 4596009 |Laryngeal structure (body structure)|
```
Demo DL queries
Ongoing challenges

• It’s still resource intensive
• The classifier needs to be synchronized with the terminology content
• Complex to serve multiple paths (viewpoints)
  • Multiple virtual servers, automatic provision of new servers
  • Share servers and suffer a minor synchronization wait to start from baseline
• Display the cascading impact of a change in a particular concept
Thanks

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YouTube video: https://youtu.be/xDi0NlcSEoM