Puzzle 1. Myth m01

Myth: COVID-19 can affect elderly only.
Fact: COVID-19 can affect anyone.

Step 1: Translating the myth in DL using Fred

1. Go to http://wit.istc.cnr.it/stlab-tools/fred/demo/
2. Obtain the graphical representation of the myth; save it as m.png
3. Obtain the DL formalisation of the myth in turtle syntax; save it as m.ttl

Step 2: Translating the fact in DL using Fred

1. Go to http://wit.istc.cnr.it/stlab-tools/fred/demo/
2. Obtain the graphical representation of the myth; save it as f.png
3. Obtain the DL formalisation of the fact in turtle syntax; save it as f.ttl

Step 3: Merging the two ontologies using Protege

1. Download and install the Protege ontology editor from https://protege.stanford.edu/
2. Start it with ./run.sh (you need java)
3. Load the myth ontology in ttl (i.e. the file m.ttl)
4. Load in the same window the fact ontology in ttl (i.e. the file f.ttl)
5. Merge them using Refactor Tab - Merge ontologies
6. Save/export the result in OWL/XML syntax with the name m-f.owl

Step 4: Simply the ontology

1. Load the merged ontology m-f.owl in Racer
2. Translate it into racer syntax: (save-kb "m-f.racer" :syntax :racer) [1] [2]
3. Simplify the ontology: open the "m-f.racer" with a text editor and remove what is irrelevant (e.g. Tbox, Abox names, prefixes, part of speech etc)
4. Save the relevant knowledge in m-f-simplified.racer.

Step 5: Add knowledge to detect conflict

1. Add your own knowledge (axioms, assertions or rules) such that Racer can signal inconsistencies between myth and fact (tbox-coherent? or abox-consistent? should return false)

[1] Racer should be started with -unsafe option; ./Racer -u
[2] The ontology will be saved in the same folder with the Racer server

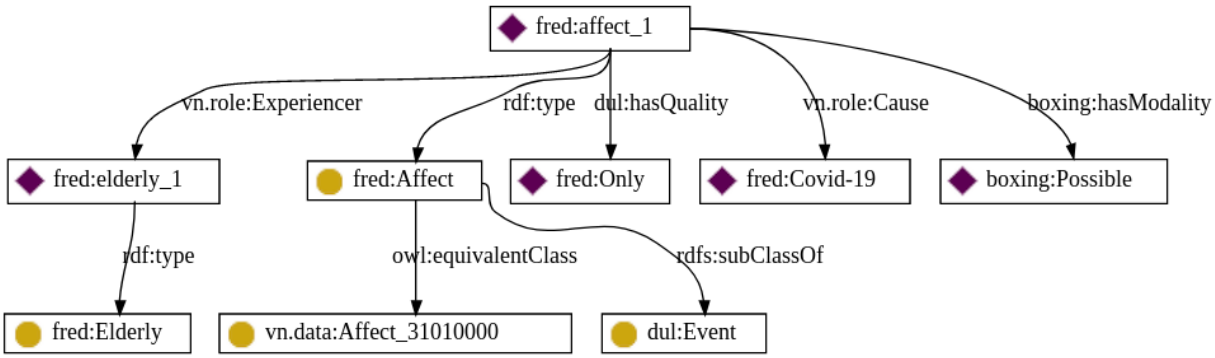

Figure 1: Step 1: Automatically translating the myth into DL: "COVID-19 can affect elderly only"

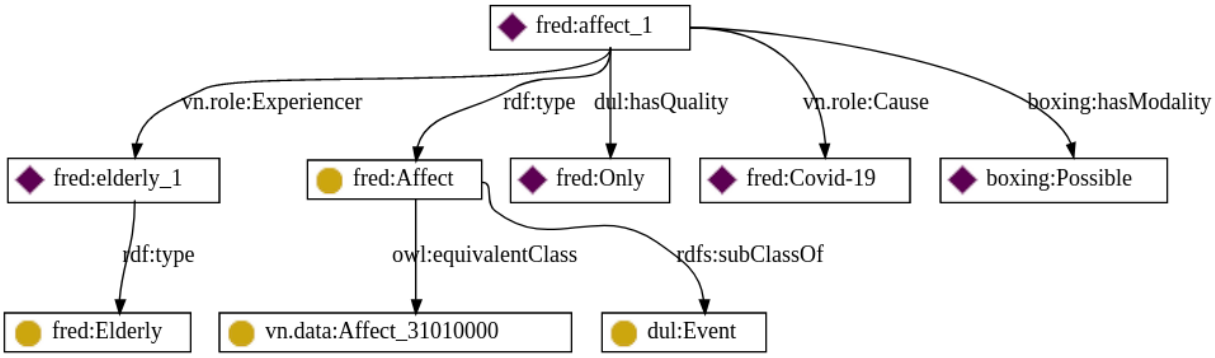

Figure 2: Step 2. Automatically translating the fact into DL: "COVID-19 can affect anyone."

Step 6: Document your case

1. Complete this latex template
2. Explain the remaining knowledge after simplification
3. Explain the added knowledge required to detect conflict
4. Submit the archive on Moodle (racer files, ttl files, owl file, images, tex, pdf)

Listing 1: Step 4: Remaining knowledge after simplification in racer syntax

```
(DEFINE-PRIMITIVE-ROLE hasModality)
(DEFINE-PRIMITIVE-ROLE Cause)
(DEFINE-PRIMITIVE-ROLE hasQuality)
(DEFINE-PRIMITIVE-ROLE Experiencer)

(IMPLIES Affect Event)
(DEFINE-CONCEPT Affect Affect_31010000)

(INSTANCE affect_1 Affect)
(INSTANCE elderly_1 Elderly)
(INSTANCE person_1 Person)

(RELATED affect_1 Possible hasModality)
(RELATED affect_1 Only hasQuality)
(RELATED affect_1 Covid-19 Cause)
(RELATED affect_1 elderly_1 Experiencer)
(RELATED affect_1 person_1 Experiencer)
```

In Fig. 4 shows the relevant knowledge used to detect conflict (Note that the prefixes of the imported ontologies have been removed). The FRED tool has detected the modality *possible*

$$Affect \sqsubseteq Event \quad (1)$$
$$affect_1 : Affect \quad (2)$$
$$elderly_1 : Elderly \quad (3)$$
$$person_1 : Person \quad (4)$$
$$\langle affect_1, possible \rangle : hasModality \quad (5)$$
$$\langle affect_1, only \rangle : hasQuality \quad (6)$$
$$\langle affect_1, covid-19 \rangle : cause \quad (7)$$
$$\langle affect_1, elderly_1 \rangle : experiencer \quad (8)$$
$$\langle affect_1, person_1 \rangle : experiencer \quad (9)$$
$$(10)$$

Figure 3: Step 4: Remaining knowledge after simplification in DL syntax

$$Elderly \sqsubseteq Person (11)$$
$$person_1 : \neg Elderly (12)$$
$$(?x\ Only\ hasQuality) \wedge (?x\ ?y\ Experiencer)(?x\ ?z\ Experiencer)(?y\ Elderly) \rightarrow (?z\ Elderly) (13)$$

Figure 4: Step 5: Knowledge added to detect conflict in DL syntax

for the individual $affect_1$. The same instance $affect_1$ has quality *Only*. However, the role *experiencer* relates the instance $affect_1$ with two individuals: $elderly_1$ and $person_1$.

Listing 2: Step 5: Adding background knowledge or/and rules to detect the conflict in racer syntax

```
(implies Elderly Person)
(INSTANCE person_1 (not Elderly))

(define-rule (?z Elderly)
   (and (?x Only hasQuality)
        (?x ?y Experiencer)
        (?x ?z Experiencer)
        (?y Elderly)
))
```

The axioms in Fig. 4 state that an elderly is a person and that the instance $person_1$ is not elderly. The SWRL rule states that for each individual $?x$ with the quality *only* that is related via the role *experiencer* with two distinct individuals $?y$ and $?z$ (where $?y$ is an instance of the concept *Elderly*), then the individual $?z$ is also an instance of *Elderly*.

The conflict comes from the fact that $person_1$ is not an instance of Elderly, but still he/she is affected by COVID (i.e.$\langle affect_1, person_1 \rangle : experiencer$).

Bibliography