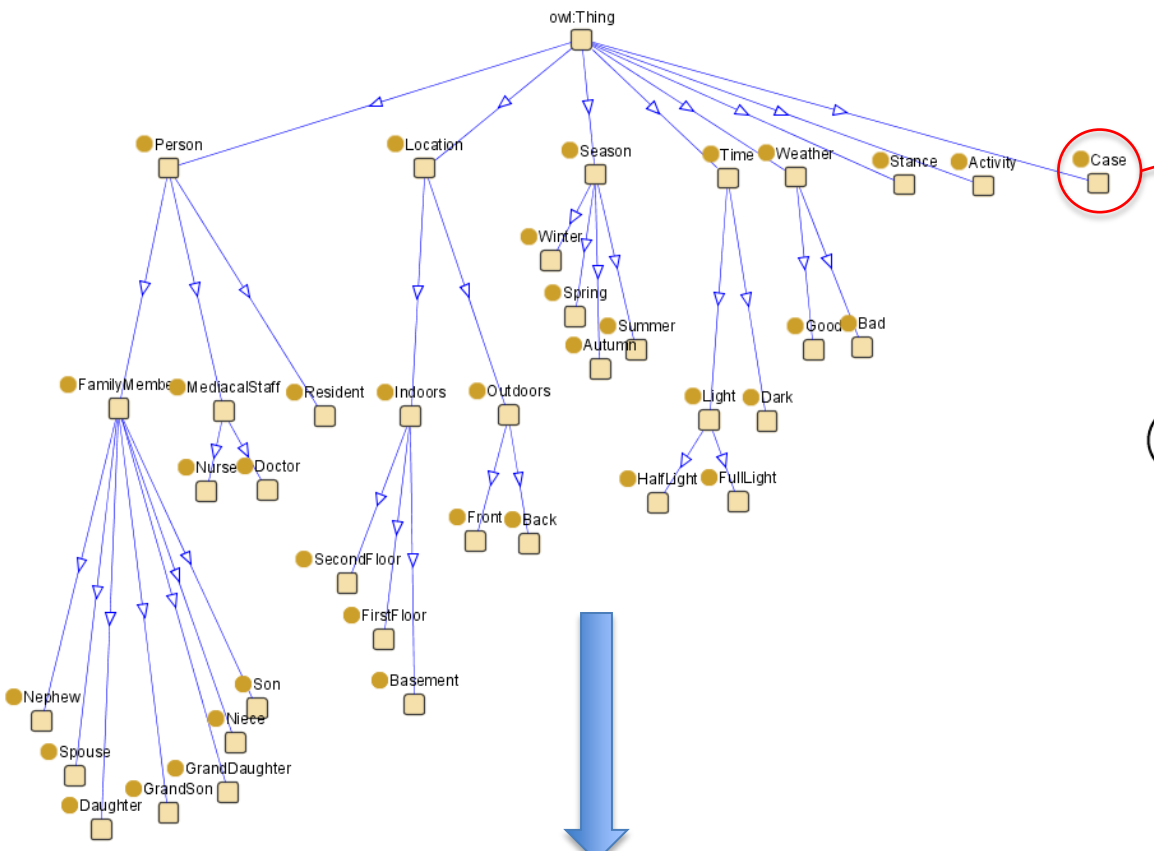
A real-time, context-aware activity recognition system

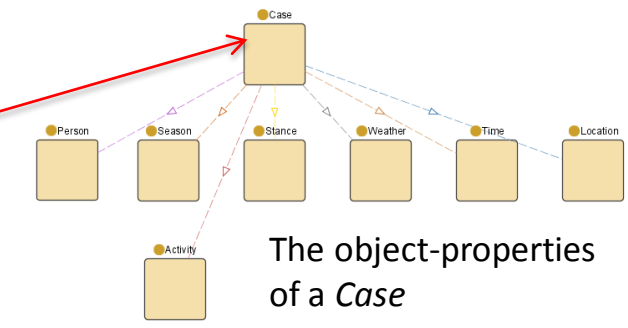
securityandtrust.lu

Research Question: How to recognize the (single) current activity of a person in real-time, by using the semantics of ontologies?

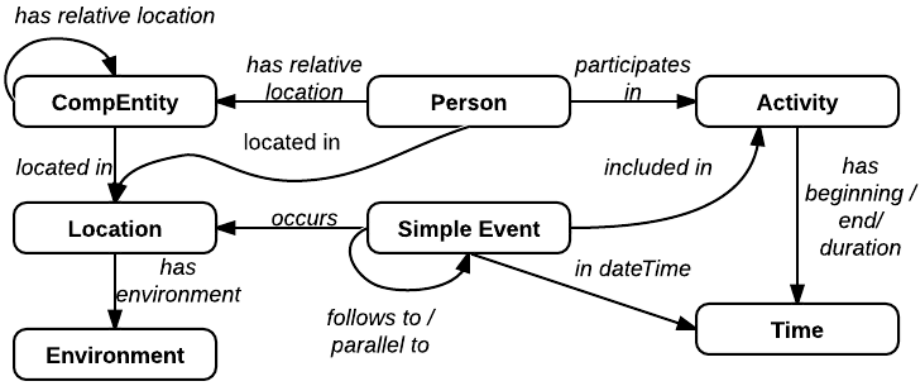
Contributions

- Activity recognition in real-time
- Propositionalization of an ontology
- Large-scale datasets are supported





The object-properties of a *Case*



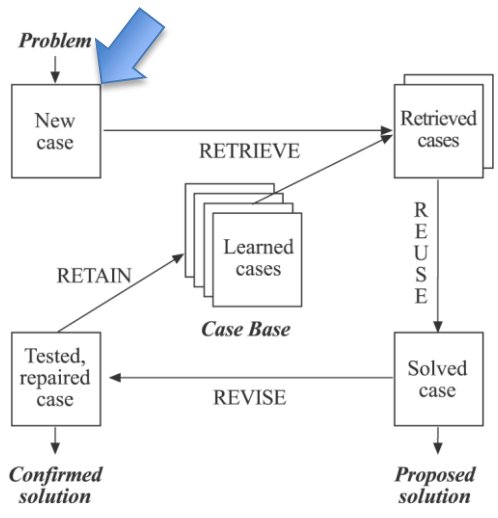
A more realistic ontology

```
<Case rdf:ID="Case74">
  <has-Person      rdf:resource="#Nick"/>
  <has-Season      rdf:resource="#July"/>
  <has-Weather     rdf:resource="#Stormy"/>
  <has-Time        rdf:resource="#Noon"/>
  <has-Location    rdf:resource="#Kitchen"/>
  <has-Stance      rdf:resource="#Standing"/>
  <has-Activity    ???/>
</Case>
```

$$\forall S \in subclasses(C)$$
$$value(S) = \begin{cases} 1, if\ S \in superclasses(a) \\ 0,\ else \end{cases},$$

where
$C \in range(P)$,
$P \in properties\ of\ the\ Case\ class$ and
$a = instance(C)$.

*Nick,**0,0,0,0,0,0,0,0,0,0,0,0,0,1**,July,**0,0,0,1**,Stormy,**1,0**,Noon,**0,1,0,1**,Kitchen,**1,1,0,0,0,0,0,0**,Standing*



The Case-Based Reasoning Cycle

Reducing the Dataset

Reducing the number of attributes:

for each subclass *S* (not only direct) of a given objectproperty's range class
  if *S* only has one father *F* and *F* is marked
    add *S* to the attributes
  else
    mark *F* /* this actually means skip *F* */

Reducing the number of cases:

- Set a threshold for the number of cases
- When this threshold is met delete half of the cases
  - randomly
  - keeping the original distribution ratio as much as possible

Future Work

- Validation of the predictions
- Smart Classroom (activity of a group)
- Ambient Assisted Living (assistance of the elderly)

Demo available at: http://www.ics.forth.gr/isl/_videos/Real_time_activity_recognition_in_AmI.avi

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