

OWL-Axioms

TBox – Knowledge about classes of things („classes“)
RBox – Knowledge about their relations („object properties“)
ABox – Knowledge about class instances („individuals“)

Box	Assertion Name	Semantic	Example
TBox	SubClass Of	Every C is a D	Every Dog is an Animal
TBox	Equivalent To	Every C is a D and vice-versa	Every Town is a City and vice-versa
ABox	Type	a is a C	OlafScholz is a Chancellor
ABox	Object property	$r(a,b)$	Donald loves Daisy
RBox	SubPropertyOf (Chain)	$r(x,y)$ and $s(y,z)$, then $t(x,z)$	$\text{momOf}(x,y) \ \& \ \text{sisterOf}(y,z) \Rightarrow$ $\text{auntOf}(x,z)$
...

Let's replace simple classes (C,D) by more complex ones!

Syntax (Protégé)	Semantic	Example
C and D	Objects with both the class C and D	Flower and Red
not(C)	Objects that are not of class C	not(Human)
C or D	Objects with any of the classes C and D	Dog or Cat
\exists some C	Objects that are related to some object of class C via r	loves some Human
...

Reasoning Example I

1. Every Robot is an Agent
2. PR2 is a Robot

→ PR2 is a Robot

Reasoning Example II

1. EuropeanCitizen = human that livesIn a EuropeanCity
2. Bremen is a EuropeanCity
3. Anna is a human
4. Anna livesIn Bremen

→ Anna is a EuropeanCitizen

Reasoning Example III

1. Every EuropeanCitizen is European or has a Visa
2. Every European is a Human
3. VisaOwner = has a visa
4. Every VisaOwner is a Human

→ Every EuropeanCitizen is a Human

Reasoning Example IV

1. Every EuropeanCitizen is European or has a Visa
2. Ben is a EuropeanCitizen
3. Ben is not European and does not have a visa

→ **Error!**

Hands-On!

1. Download and install Protégé from protege.stanford.edu

Reasoning Example V

1. Every Child loves Chocolate
2. CoolChild = loves Chocolate and Spinach
3. MomsBlattspinat is a Spinach
4. Tim is a child and loves MomsBlattspinat

→ Tim is a CoolChild

Box	Assertion Name	Semantic
TBox	SubClass Of	Every <u>C</u> is a <u>D</u>
TBox	Equivalent To	Every <u>C</u> is a <u>D</u> & vice-versa
ABox	Type	<u>a</u> is a <u>C</u>
ABox	Object property	<u>r(a,b)</u>
RBox	SubPropertyOf	<u>r(x,y)</u> and <u>s(y,z)</u> , then <u>t(x,z)</u>

Syntax (in Protégé)	Example
C and D	Flower and Red
Not(C)	not(Human)
C or D	Dog or Cat
r some C	loves some Human

Reasoning Example VI

1. Errol lives in MexicoCity
2. MexicoCity is the Capital of Mexico
3. Whoever lives in a Country's Capital is a Citizen of that

→ Errol is a Citizen of Mexico


Box	Assertion Name	Semantic
TBox	SubClass Of	Every <u>C</u> is a <u>D</u>
TBox	Equivalent To	Every <u>C</u> is a <u>D</u> & vice-versa
ABox	Type	<u>a</u> is a <u>C</u>
ABox	Object property	<u>r(a,b)</u>
RBox	SubPropertyOf	<u>r(x,y)</u> and <u>s(y,z)</u> , then <u>t(x,z)</u>

Syntax (in Protégé)	Example
C and D	Flower and Red
Not(C)	not(Human)
C or D	Dog or Cat
r some C	loves some Human

Hands-On!

1. Download and install Protégé from protege.stanford.edu
2. Recreate Reasoning Examples I – IV in Protégé

Hands-On!

1. Download and install Protégé from protege.stanford.edu
2. Recreate Reasoning Examples I – IV in Protégé
3. Go to  <https://github.com/ease-crc/soma>
4. Clone the repository, or download it (.zip)
5. Open the file owl/SOMA-ALL.owl in Protégé

Modeling task

Recipe, Popcorn kernels, Popcorn, Robot, Butter, Sugar, Stove, Pan, Heating, Popping, Removing, Adding, Placing, Stirring, Spoon

1. Take the words on the top right and sort them into the SOMA taxonomy.
2. Create ABox instances for heating popcorn kernels and butter inside a pan on a stove.
3. Create ABox instances for popping the popcorn kernels.
4. Also include relations, e.g., between actions. Look for **causes**, **precedes**, etc.
5. Connect the Tasks to the Recipe.
6. Bonus: what is **Waiting**? How would the ABox look like?

