

# OTTR Templates

## 1 From the lecture

- a) What does OTTR stand for?
- b) What do we mean when we say that OTTR-templates hide complexity?

### Solution

- a) OTTR stands for Reasonable Ontology Templates
- b) It hides the technicalities in OWL and logics and lets the user work on a higher level of abstraction

## 2 OTTR template for the Simpsons family

### 2.1 Exercise: Signature of a family member

In this exercise, we will create the signature (not the template) of a member of the Simpsons family. Call the template `ex:FamilyMember`. It shall take three parameters:

1. `personIRI`,
2. `name`
3. `age`.

Add types, optional, non-blank, and default values where applicable. The output for Homer should be like this:

```
[ a foaf:Person ;  
  foaf:age "36"^^xsd:integer ;  
  foaf:name "Homer Simpson"  
] .
```

## Solution

```
o-fam:FamilyMember[
  ottr:IRI ?personIRI,
  ! xsd:string ?name,
  xsd:integer ?age
]
```

## 2.2 Exercises: Simpsons family member template

In this exercise, we will use the signature and add the rest of the template. You should make use of the `o-rdf:Type` from the [OTTR reference library](#). Include the correct provide prefixes in the solution. You should save the template as a file `familymember.stottr`

## Solution

```
@prefix fam:      <http://www.ifi.uio.no/IN3060/family#> .
@prefix foaf:     <http://xmlns.com/foaf/0.1/> .
@prefix xsd:      <http://www.w3.org/2001/XMLSchema#> .
@prefix ottr:     <http://ns.ottr.xyz/0.4/> .
@prefix o-fam:    <http://www.ifi.uio.no/IN3060/family-ottr#> .
@prefix o-rdf:    <http://tpl.ottr.xyz/rdf/0.1/> .
```

```
o-fam:FamilyMember[
  ottr:IRI ?personIRI,
  ! xsd:string ?name,
  !? xsd:integer ?age
] :: {
  o-rdf:Type(?personIRI, foaf:Person),
  ottr:Triple(?personIRI, foaf:name, ?name),
  ottr:Triple(?personIRI, foaf:age, ?age)
} .
```

## 2.3 Exercise: Get lutra

Lutra is the open source implementation of the OTTR-library. Find and download the latest version of Lutra CLI at <https://gitlab.com/ottr/lutra/lutra/-/releases>.

## 2.4 Exercises: Expansion

Test your templates using the following data in stOTTR-format.

```
@prefix o-fam: <http://www.ifi.uio.no/IN3060/family-ottr#> .
```

```
o-fam:FamilyMember(_:homer, "Homer Simpson", 36)
o-fam:FamilyMember(_:marge, "Marge Simpson", 34) .
o-fam:FamilyMember(_:lisa, "Lisa Simpson", 8) .
o-fam:FamilyMember(_:bart, "Bart Simpson", 10) .
o-fam:FamilyMember(_:maggie, "Maggie Simpson", none) .
```

### 2.4.1 Tip:

Copy the 5 statements into a file `sim.stottr`. You should be able to run the command:

```
java -jar lutra.jar --mode expand -L stottr -l familymember.stottr \
-i stottr sim1.stottr
```

### Solution

```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
```

```
[ a          foaf:Person ;
  foaf:age   8 ;
  foaf:name  "Lisa Simpson"
] .
```

```
[ a          foaf:Person ;
  foaf:age   36 ;
  foaf:name  "Homer Simpson"
] .
```

```
[ a          foaf:Person ;
  foaf:age   10 ;
  foaf:name  "Bart Simpson"
] .
```

```
[ a          foaf:Person ;
  foaf:name  "Maggie Simpson"
] .
```

```
[ a          foaf:Person ;
  foaf:age   34 ;
  foaf:name  "Marge Simpson"
] .
```

## 2.5 Exercise: father, mother and spouse

In the template, include father, mother and spouse. Use the same file `familymember.stottr`

### Solution

```
@prefix fam:      <http://www.ifi.uio.no/IN3060/family#> .
@prefix foaf:    <http://xmlns.com/foaf/0.1/> .
@prefix xsd:     <http://www.w3.org/2001/XMLSchema#> .
@prefix ottr:    <http://ns.ottr.xyz/0.4/> .
@prefix o-fam:   <http://www.ifi.uio.no/IN3060/family-ottr#> .
@prefix o-rdf:   <http://tpl.ottr.xyz/rdf/0.1/> .

o-fam:FamilyMember[
    ottr:IRI ?personIRI,
    ! xsd:string ?name,
    !? xsd:integer ?age,
    ? ottr:IRI ?father,
    ? ottr:IRI ?mother,
    ? ottr:IRI ?spouse
] :: {
    o-rdf:Type(?personIRI, foaf:Person),
    ottr:Triple(?personIRI, foaf:name, ?name),
    ottr:Triple(?personIRI, foaf:age, ?age),
    ottr:Triple(?personIRI, fam:hasFather, ?father),
    ottr:Triple(?personIRI, fam:hasMother, ?mother),
    ottr:Triple(?personIRI, fam:hasSpouse, ?spouse)
} .
```

## 2.6 Exercise: Triple expansion

Use `lutra` to expand the following data (`stOTTR`).

```
@prefix o-fam:   <http://www.ifi.uio.no/IN3060/family-ottr#> .

o-fam:FamilyMember(_:homer, "Homer Simpson", 36, _:abraham, _:mona, _:marge) .
o-fam:FamilyMember(_:marge, "Marge Simpson", 34, none, none, _:homer) .
o-fam:FamilyMember(_:lisa, "Lisa Simpson", 8, _:homer, _:marge, none) .
o-fam:FamilyMember(_:bart, "Bart Simpson", 10, _:homer, _:marge, none) .
o-fam:FamilyMember(_:maggie, "Maggie Simpson", 1, _:homer, _:marge, none) .
o-fam:FamilyMember(_:abraham, "Abraham Simpson", 83, none, none, _:mona) .
o-fam:FamilyMember(_:mona, "Mona Simpson", 66, none, none, _:abraham) .
o-fam:FamilyMember(_:herb, "Herbert Powell", 39, _:abraham, none, none) .
```

### 2.6.1 Tip:

Copy the content to a file `simpsons_members.stottr`, you can then use the command:

```
java -jar lutra.jar --mode expand -L stottr -l simpsons.stottr -f \  
-o output -I stottr simpsons_members.stottr
```

### Solution

The output of the expansion should look something like this:

```
@prefix fam:    <http://www.ifi.uio.no/IN3060/family#> .  
@prefix rdf:    <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .  
@prefix foaf:   <http://xmlns.com/foaf/0.1/> .
```

```
[ a          foaf:Person ;  
  fam:hasFather  _:b0 ;  
  fam:hasMother  _:b1 ;  
  foaf:age       8 ;  
  foaf:name      "Lisa Simpson"  
] .
```

```
[ a          foaf:Person ;  
  fam:hasFather  _:b2 ;  
  foaf:age       39 ;  
  foaf:name      "Herbert Powell"  
] .
```

```
_:b0  a          foaf:Person ;  
      fam:hasFather  _:b2 ;  
      fam:hasMother  _:b3 ;  
      fam:hasSpouse  _:b1 ;  
      foaf:age       36 ;  
      foaf:name      "Homer Simpson" .
```

```
_:b2  a          foaf:Person ;  
      fam:hasSpouse  _:b3 ;  
      foaf:age       83 ;  
      foaf:name      "Abraham Simpson" .
```

```
[ a          foaf:Person ;  
  fam:hasFather  _:b0 ;  
  fam:hasMother  _:b1 ;  
  foaf:age       10 ;
```

```

    foaf:name      "Bart Simpson"
] .

[ a                foaf:Person ;
  fam:hasFather   _:b0 ;
  fam:hasMother   _:b1 ;
  foaf:age        1 ;
  foaf:name       "Maggie Simpson"
] .

_:b1  a                foaf:Person ;
      fam:hasSpouse   _:b0 ;
      foaf:age        34 ;
      foaf:name       "Marge Simpson" .

_:b3  a                foaf:Person ;
      fam:hasSpouse   _:b2 ;
      foaf:age        66 ;
      foaf:name       "Mona Simpson" .

```

### 3 Exercises: Norwegian royal family

In this exercise, you will use the template that you created in Exercise 2 to create an rdf-graph with some members (and ancestors) of the Norwegian Royal Family (see Table 1).

#### 3.1 Exercise: Expand the royal family graph

The data about the royal family is available as an Excel sheet at [http://example.org/royal\\_family.xlsx](http://example.org/royal_family.xlsx). Use this together with the `familymember.stottr`-file from exercise 2.5 as inputs to `lutra` and expand the graph.

##### 3.1.1 Tip:

You can use the command:

```
java -jar lutra.jar --mode expand -L stottr -l familymember.stottr -f \
-o royal_out -I tabottr royal_family.xlsx
```

#### Solution

```

@prefix fam: <http://www.ifi.uio.no/IN3060/family#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .

_:b0  a                foaf:Person ;
      fam:hasSpouse   _:b1 ;

```

Name	Age	Father	Mother	Spouse
Christian IX	87			Louise
Frederik VII	68	Christian IX	Louise	Lovisa
Lovisa				
Ragnhild	82	Olav V	Märtha	
Haakon VII	85	Frederik VII	Lovisa	Maud
Maud	68			
Märtha	53			Olav V
Astrid	89	Olav V	Märtha	
Olav V	87			Märtha
Harald V	84	Olav V	Märtha	Sonja
Sonja	83			Harald V
Haakon M	47	Harald V	Sonja	Mette-Marit
Mette-Marit	47			Haakon M
Martha Louise	49	Harald V	Sonja	
Ingrid Alexandra	17	Haakon M	Mette-Marit	
Sverre Magnus	15	Haakon M	Mette-Marit	

Table 1: Some members (and ancestors) of the Norwegian Royal Family

```

foaf:age      53 ;
foaf:name     "Martha av Norge" .

_:b2 a foaf:Person ;
    fam:hasSpouse _:b3 ;
    foaf:age      83 ;
    foaf:name     "Sonja" .

_:b3 a foaf:Person ;
    fam:hasFather _:b1 ;
    fam:hasMother _:b0 ;
    fam:hasSpouse _:b2 ;
    foaf:age      84 ;
    foaf:name     "Harald V" .

_:b1 a foaf:Person ;
    fam:hasFather [ a foaf:Person ;
                    fam:hasFather [ a foaf:Person ;
                                    fam:hasFather [ a foaf:Person ;
                                                    fam:hasSpouse _:b4 ;
                                                    foaf:age      87 ;
                                                    foaf:name     "Christian IX av Danmark"
                                                    ] ;
                                    fam:hasMother _:b4 ;
                                    fam:hasSpouse [ a foaf:Person ;
                                                    foaf:name     "Lovisa av Sverige"
                                                    ] ;
                                    foaf:age      68 ;
                                    foaf:name     "Frederik VII av Danmark"
                                    ] ;
                    fam:hasMother [] ;
                    fam:hasSpouse [ a foaf:Person ;
                                    foaf:age      68 ;
                                    foaf:name     "Maud av Norge"
                                    ] ;
                    foaf:age      85 ;
                    foaf:name     "Haakon VII"
                    ] ;

```

```

        fam:hasSpouse _:b0 ;
        foaf:age      87 ;
        foaf:name     "Olav V" .

_:b5  a          foaf:Person ;
        fam:hasFather _:b3 ;
        fam:hasMother _:b2 ;
        fam:hasSpouse _:b6 ;
        foaf:age      47 ;
        foaf:name     "Haakon Magnus" .

[ a          foaf:Person ;
  fam:hasFather _:b3 ;
  fam:hasMother _:b2 ;
  foaf:age      49 ;
  foaf:name     "Martha Louise"
] .

[ a          foaf:Person ;
  fam:hasFather _:b1 ;
  fam:hasMother _:b0 ;
  foaf:age      82 ;
  foaf:name     "Ragnhild, fru Lorenzen"
] .

[ a          foaf:Person ;
  fam:hasFather _:b5 ;
  fam:hasMother _:b6 ;
  foaf:age      15 ;
  foaf:name     "Sverre Magnus"
] .

_:b6  a          foaf:Person ;
        fam:hasSpouse _:b5 ;
        foaf:age      47 ;
        foaf:name     "Mette-Marit" .

[ a          foaf:Person ;
  fam:hasFather _:b5 ;
  fam:hasMother _:b6 ;
  foaf:age      17 ;
  foaf:name     "Ingrid Alexandra"
] .

[ a          foaf:Person ;
  fam:hasFather _:b1 ;
  fam:hasMother _:b0 ;
  foaf:age      89 ;
  foaf:name     "Astrid, fru Ferner"
] .

```

## 3.2 Change vocabulary

Let's say you would like to change the vocabulary used in Section 3.1 and use the: <http://purl.org/vocab/relationship/> instead of the <http://www.ifi.uio.no/IN3060/family#-vocabulary>.

Without changing the signature, change the `o-fam:FamilyMember` template to use this new vocabulary. Add both the `parentOf` and `childOf` properties. Since this vocabulary don't distinguish between father and mother, let's also add the gender of the parents using the `foaf:gender`-property.

Now, expand the triples from the Norwegian Royal Family using the new template.

### 3.2.1 Tip:

Use the following properties:

- `rel:parentOf`



- rel:childOf
- rel:spouseOf
- foaf:gender with the string "male" or "female"

## Solution

```
@prefix foaf:    <http://xmlns.com/foaf/0.1/> .
@prefix xsd:    <http://www.w3.org/2001/XMLSchema#> .
@prefix ottr:   <http://ns.ottr.xyz/0.4/> .
@prefix o-fam:  <http://www.ifi.uio.no/IN3060/family-ottr#> .
@prefix rel:    <http://purl.org/vocab/relationship/> .
@prefix o-rdf:  <http://tpl.ottr.xyz/rdf/0.1/> .
```

```
o-fam:FamilyMember[
  ottr:IRI ?personIRI,
  ! xsd:string ?name,
  !? xsd:integer ?age,
  ? ottr:IRI ?father,
  ? ottr:IRI ?mother,
  ? ottr:IRI ?spouse
] :: {
  o-rdf:Type(?personIRI, foaf:Person),
  ottr:Triple(?personIRI, foaf:name, ?name),
  ottr:Triple(?personIRI, foaf:age, ?age),
  ottr:Triple(?father, rel:parentOf, ?personIRI),
  ottr:Triple(?mother, rel:parentOf, ?personIRI),
  ottr:Triple(?father, foaf:gender, "male"),
  ottr:Triple(?mother, foaf:gender, "female"),
  ottr:Triple(?personIRI, rel:childOf, ?father),
  ottr:Triple(?personIRI, rel:childOf, ?mother),
  ottr:Triple(?personIRI, rel:hasSpouse, ?spouse)
} .
```

## 3.3 Result of the expansion

```
@prefix rdf:    <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rel:    <http://purl.org/vocab/relationship/> .
@prefix foaf:   <http://xmlns.com/foaf/0.1/> .
```

```
_:b0 a foaf:Person ;
  rel:childOf _:b1 , _:b2 ;
  foaf:age 49 ;
  foaf:name "Martha Louise" .

_:b3 a foaf:Person ;
  rel:childOf _:b4 ;
  rel:childOf [ a foaf:Person ;
    rel:hasSpouse _:b4 ;
    rel:parentOf _:b3 ;
```

```

        foaf:age      87 ;
        foaf:gender   "male" ;
        foaf:name     "Christian IX av Danmark"
    ] ;
    rel:hasSpouse [ a      foaf:Person ;
                   foaf:name "Lovisa av Sverige"
    ] ;
    rel:parentOf  _:b5 ;
    foaf:age      68 ;
    foaf:gender   "male" ;
    foaf:name     "Frederik VII av Danmark" .

_:b6 a      foaf:Person ;
    rel:hasSpouse  _:b7 ;
    rel:parentOf  _:b2 , _:b8 , _:b9 ;
    foaf:age      53 ;
    foaf:gender   "female" ;
    foaf:name     "Martha av Norge" .

_:b10 a     foaf:Person ;
    rel:hasSpouse  _:b11 ;
    rel:parentOf  _:b12 , _:b13 ;
    foaf:age      47 ;
    foaf:gender   "female" ;
    foaf:name     "Mette-Marit" .

_:b1 a      foaf:Person ;
    rel:hasSpouse  _:b2 ;
    rel:parentOf  _:b0 , _:b11 ;
    foaf:age      83 ;
    foaf:gender   "female" ;
    foaf:name     "Sonja" .

_:b2 a      foaf:Person ;
    rel:childOf   _:b6 , _:b7 ;
    rel:hasSpouse  _:b1 ;
    rel:parentOf  _:b0 , _:b11 ;
    foaf:age      84 ;
    foaf:gender   "male" ;
    foaf:name     "Harald V" .

_:b8 a      foaf:Person ;
    rel:childOf   _:b7 , _:b6 ;
    foaf:age      89 ;
    foaf:name     "Astrid, fru Ferner" .

_:b7 a      foaf:Person ;
    rel:childOf   _:b5 ;
    rel:hasSpouse  _:b6 ;
    rel:parentOf  _:b2 , _:b8 , _:b9 ;
    foaf:age      87 ;
    foaf:gender   "male" ;
    foaf:name     "Olav V" .

_:b5 a      foaf:Person ;
    rel:childOf   _:b3 ;
    rel:childOf   [ rel:parentOf  _:b5 ;
                   foaf:gender   "female"
    ] ;
    rel:hasSpouse [ a      foaf:Person ;
                   foaf:age      68 ;
                   foaf:name     "Maud av Norge"
    ] ;
    rel:parentOf  _:b7 ;
    foaf:age      85 ;
    foaf:gender   "male" ;
    foaf:name     "Haakon VII" .

_:b9 a      foaf:Person ;
    rel:childOf   _:b7 , _:b6 ;
    foaf:age      82 ;
    foaf:name     "Ragnhild, fru Lorenzen" .

_:b11 a     foaf:Person ;
    rel:childOf   _:b2 , _:b1 ;
    rel:hasSpouse  _:b10 ;
    rel:parentOf  _:b12 , _:b13 ;
    foaf:age      47 ;
    foaf:gender   "male" ;
    foaf:name     "Haakon Magnus" .

_:b13 a     foaf:Person ;
    rel:childOf   _:b10 , _:b11 ;
    foaf:age      17 ;

```

```
foaf:name "Ingrid Alexandra" .  
_:b12 a foaf:Person ;  
rel:childOf _:b11 , _:b10 ;  
foaf:age 15 ;  
foaf:name "Sverre Magnus" .  
_:b4 rel:parentOf _:b3 ;  
foaf:gender "female" .
```