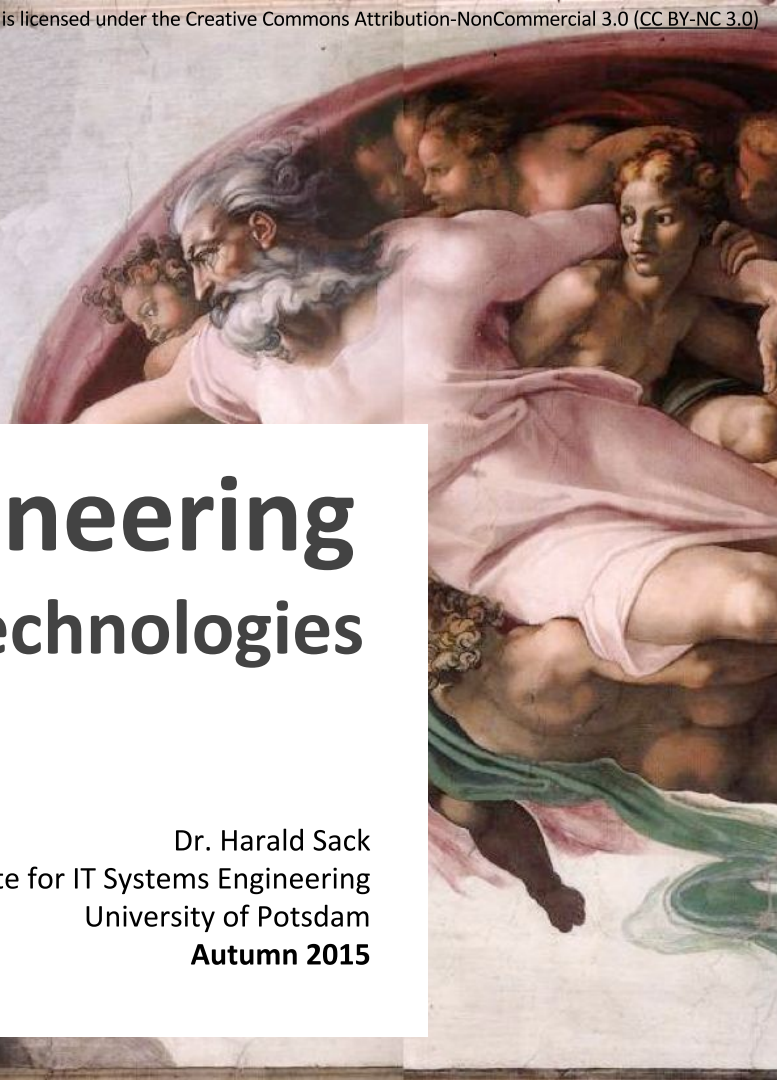
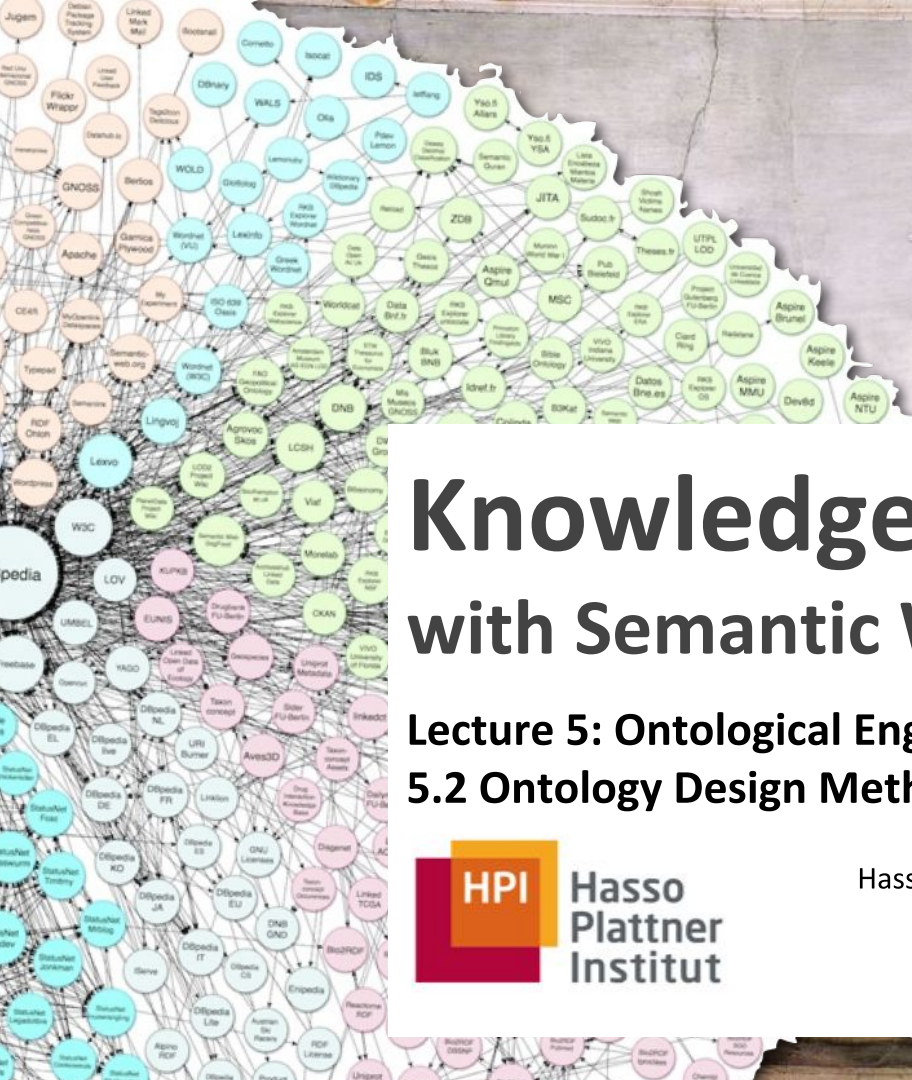




Knowledge Engineering with Semantic Web Technologies

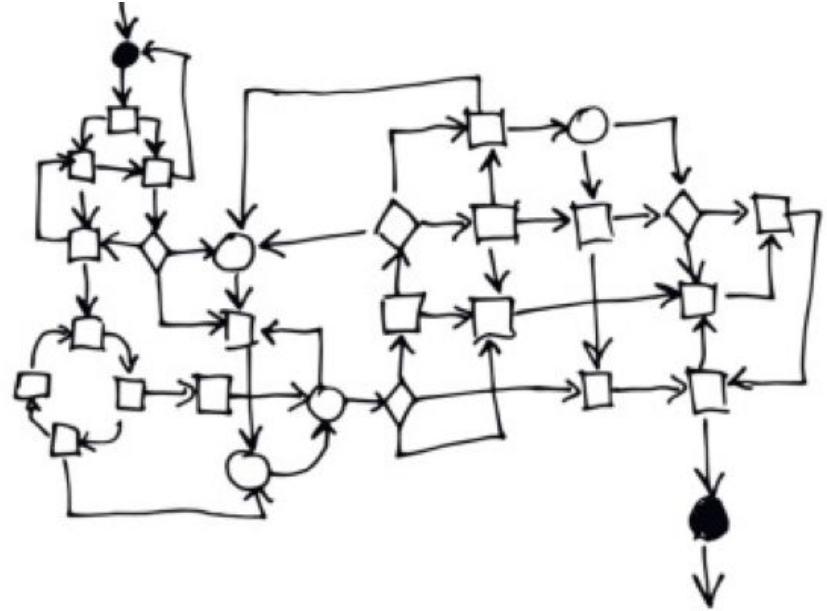
Lecture 5: Ontological Engineering 5.2 Ontology Design Methodologies



Dr. Harald Sack
Hasso Plattner Institute for IT Systems Engineering
University of Potsdam
Autumn 2015

The Ontology Development Process

SOMETHING



**Great
Ontology**

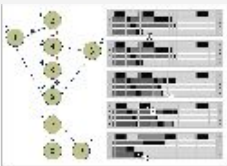


according to

<http://geekandpoke.typepad.com/geekandpoke/2012/01/simply-explained-dp.html>

Ontology Design

Management



scheduling



control



quality assurance

Design Oriented



environment study



feasibility study



specification



conceptualization



formalization



implementation



maintenance



use / re-use

Support



knowledge acquisition



evaluation



integration



documentation



merging



configuration management



alignment

Ontology Development 101

(Noy, McGuinness, 2000)

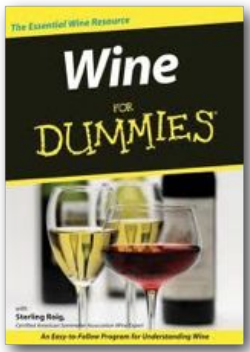
- Example of a wine and food ontology



Which wine fits to fish?



French wine growing regions and wine



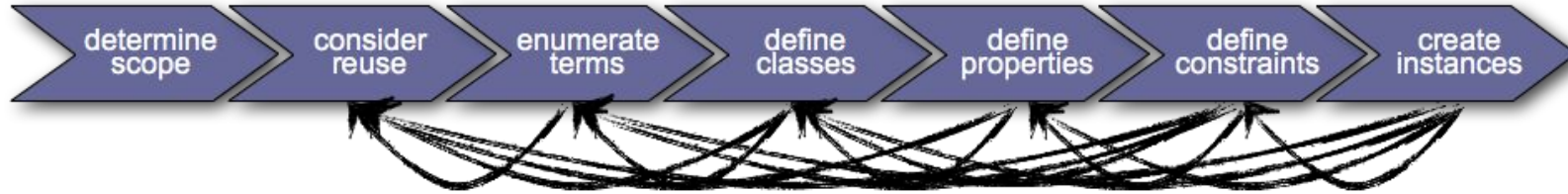
A shared ontology on wine and food



Californian wine growing regions and wine

Ontology Development 101

(Noy, McGuinness, 2000)



- in practice an **iterative Process** that **repeats continuously** and improves the ontology
- there are always **different approaches** for modelling an ontology
- in practice the designated application decides about the modelling approach

„There is no one correct way to model a domain.
There are always viable alternatives.“

Determine Domain and Focus



- Which **domain** should be covered by the ontology?
- **What** should the ontology be used **for**?
- What types of **Questions** should be answered by the knowledge represented in the ontology?
- **Who** will use and maintain the ontology?
- Formulation of **Competence Questions**

Determine Domain and Focus

determine
scope

consider
reuse

enumerate
terms

define
classes

define
properties

define
constraints

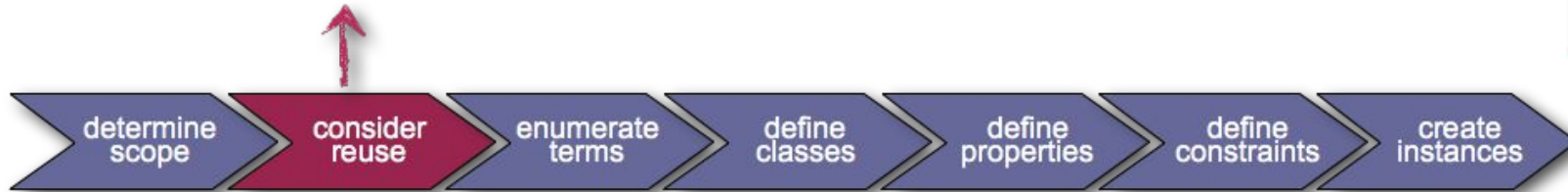
create
instances

Competence Questions (Wine Ontology)

- Which properties of the wine should be considered for modelling?
- Is Bordeaux a white wine or a red wine?
- Does a Sauvignon Blanc match with fish?
- Which wine matches best for grilled vegetables?
- Which properties of a wine do influence whether it matches with a specific dish?
- Does the bouquet of a wine change with time?
- Does the bouquet of a wine change with the weather?
- ...

These Questions might change
within the ontology life cycle

Consider Reuse



- Why should we consider reuse?
 - in order to save **cost**
 - in order to apply **tools** that are applied for other existing ontologies also for our own ontology
 - in order to reuse ontologies that have been validated by their application

If you don't find a suitable ontology or if the adaption is too complex then create a new ontology!

Develop a Terminology



- About which **concepts** are we talking?
- Which **properties** have these concepts?
- **What** do we want **to say** about these concepts?

Example: **Wine Ontology**

- *wine, grape, winery, location,...*
- *a wine's color, body, flavor, sugar content,...*
- *subtypes of wine: white wine, red wine, Bordeaux wine,...*
- *types of food: seafood, fish, meat, vegetables, cheese,...*
- ...

Develop Classes and Class Hierarchies

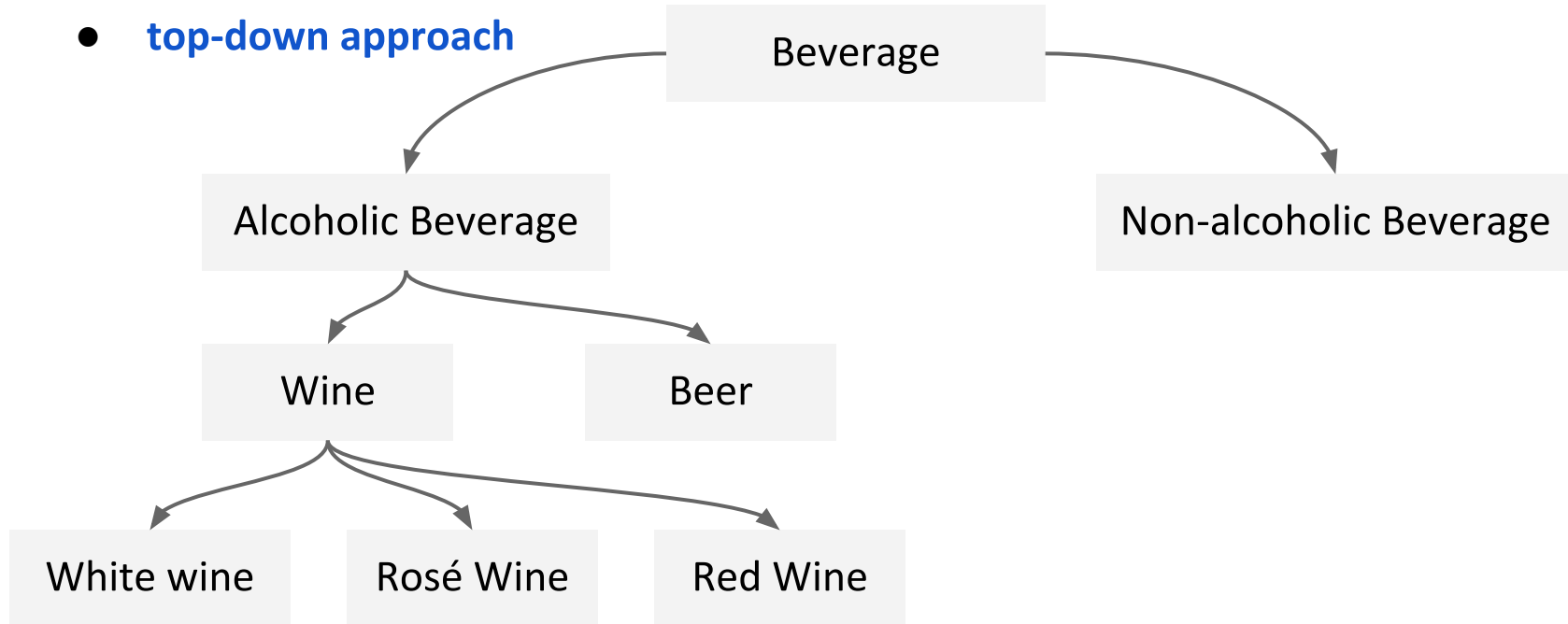


- **Classes** are concepts in the designated domain
 - *class of wines*
 - *class of wineries*
 - *class of red wines*
 - ...
- Classes are collections of objects with **similar properties**
- Choose a **top-down / bottom-up / middle-out** approach to model class hierarchies

Develop Classes and Class Hierarchies



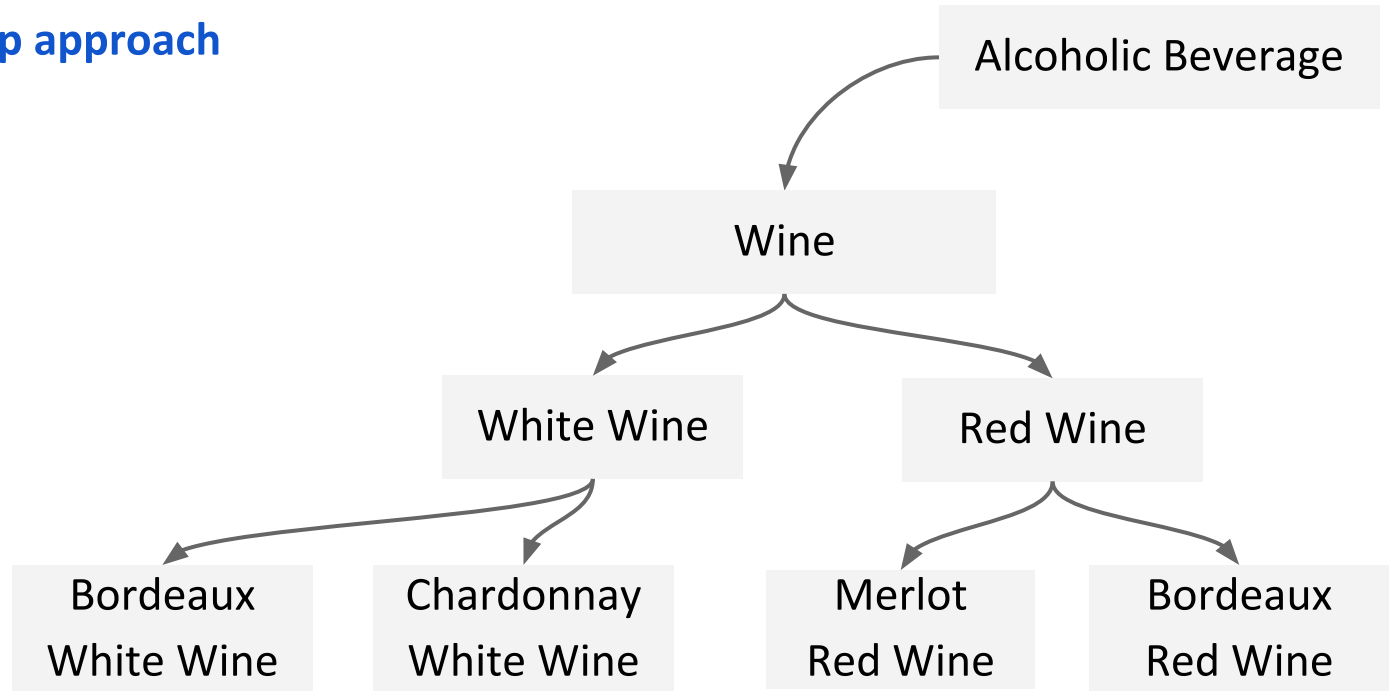
- **top-down approach**



Develop Classes and Class Hierarchies



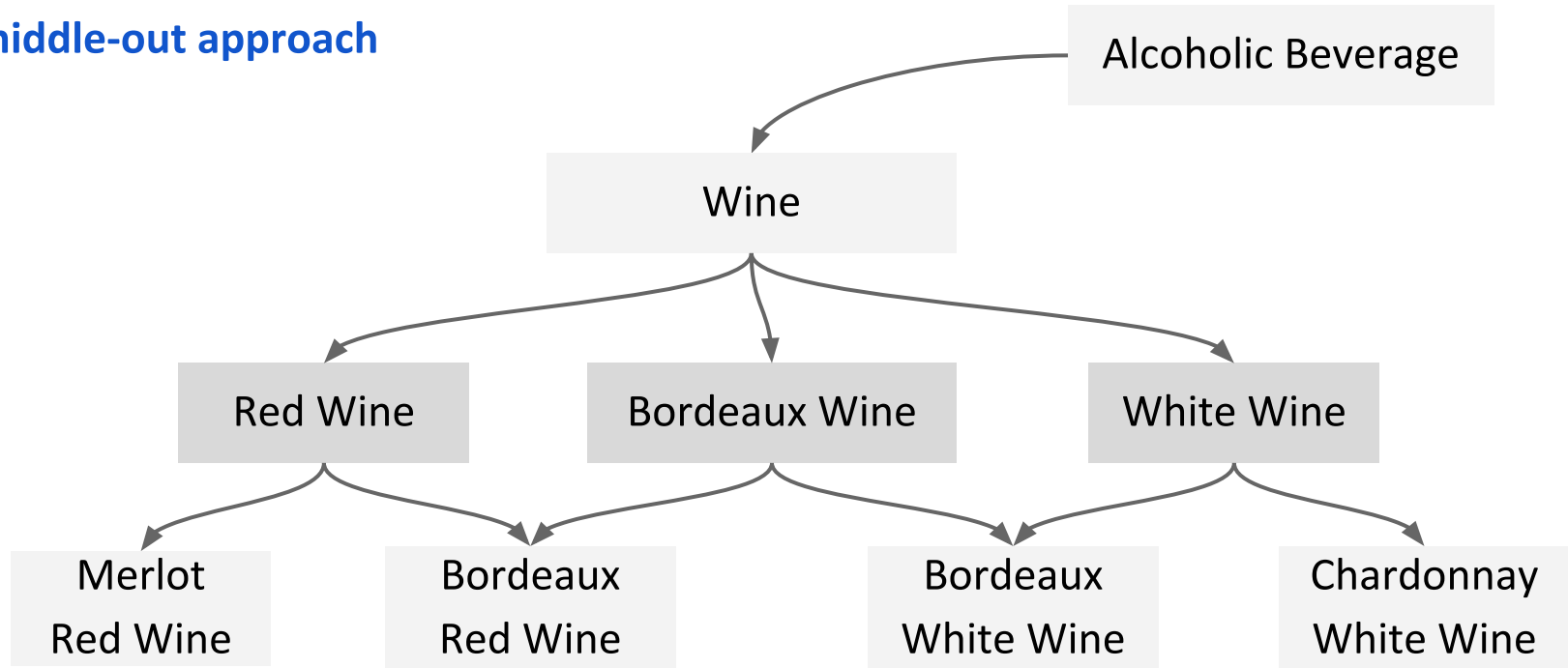
- **bottom-up approach**



Develop Classes and Class Hierarchies



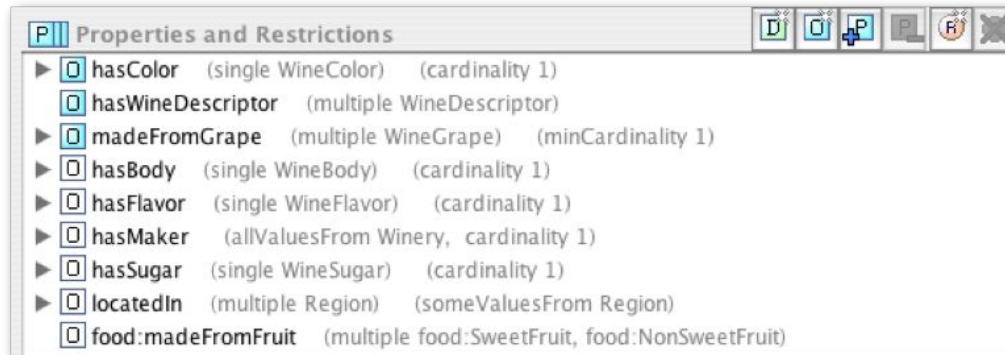
- **middle-out approach**



Define Properties



- **Properties** in a class definition describe attributes of instances
 - *every wine has a color, residual sugar, producer, etc...*



Define Property Constraints



- **Property constraints** (restrictions) describe or restrict the set of possible property values
 - *The name of a wine is a String*
 - *The producer is an instance of Winemaker...*



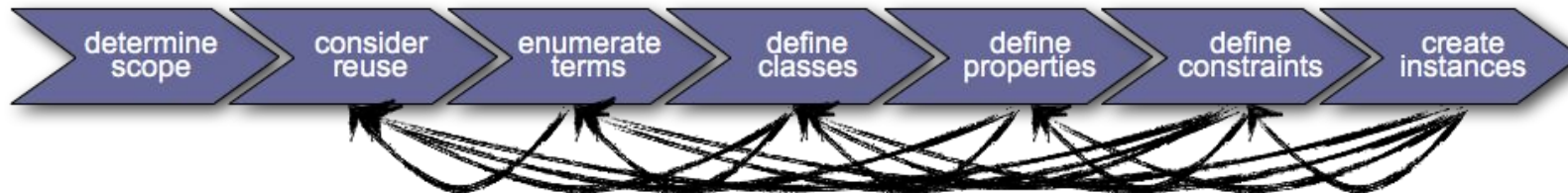
Definition of Instances



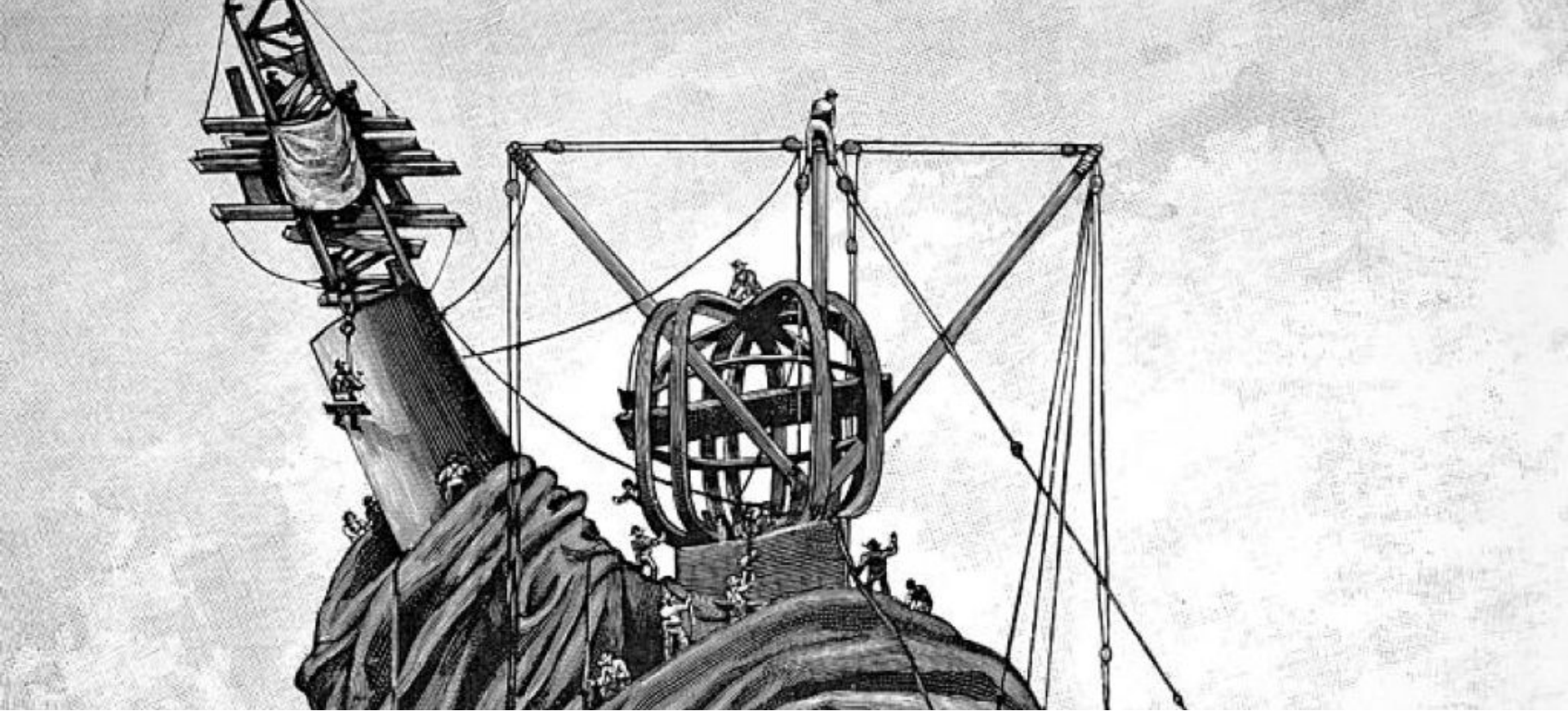
- Create **instances for the classes**
 - Every **class** directly becomes the **type** of its instances
 - Every **superclass** of a direct type is also type of its instances
- Create **instances for properties**, i.e. assignment of property values for the instances according to the given constraints
- *„the glass of red wine that I drank last supper...”*

Ontology Development 101

(Noy, McGuinness, 2000)



- Ontology development in practice is an **iterative Process** that **repeats continuously** and improves the ontology



03: Ontology Learning

OpenHPI - Course Knowledge Engineering with Semantic Web Technologies

Lecture 5: Ontological Engineering