Expressing uncertain statements in digital metadata.
The case of
Digital Cultural Heritage

Fabio Vitali
Alma Mater – Università di Bologna

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Summary

The use of metadata in Cultural Heritage
- What are metadata
- problems of metadata in Cultural Heritage
  - coercion, reticence, dumping

Uncertainty
- Types of uncertainties
  - ignorance, evolving data, disagreements, challenges

Expressing uncertainty in Cultural Heritage
- Semantic web technologies
- Reification, Named Graphs, ontologies, RDF-star

Conjectures
- Truth and statements: undisputed, disputed, settled statements
- Features of coniectures

Metadata

What is metadata?

- Metadata means "data about data"
- Metadata is "data that provides information about other data"

I want to focus in my speech on situations in which data is items of the cultural heritage and data is structured and labelled pieces of information.

In fact, text documents talking about cultural heritage are not traditionally included in metadata, but catalogues and inventories are.

Information overload and IT

- The difficulty in understanding an issue and effectively making decisions when one has too much information about that issue.

- We use IT to generate too much information.

- We need to use IT to make sense of so much information
  - Texts: NLP tools, machine learning, tools based on statistical inferences about
  - Datasets: correctly labelled and structured datasets either heavily structured or constrained models.

- If information is not searchable it will not be found. It does not exist

- How much structured information about cultural heritage is fed into machines? Are they reliable? Complete? Relevant? Interesting?

Catalogues, inventories, metadata collections

In partial deviation from the previous definition, metadata is described as either:

- Descriptive — Used for discovery and identification. E.g.: as title, abstract, author, and keywords.

- Structural — metadata about containers of data and indicates how compound objects are put together.

- Administrative — to help manage the resources e.g., type, permissions, and when and how it was created.

- Reference — information about the contents and quality.

- Statistical — processes that collect or produce statistics

- Legal —information about the creator, copyright holder, and public licensing.

There is a clear focus on objective, factual information about data aimed at better management of resources.

Problems with this approach

These metadata categories, and the metadata schemas that were generated out of them, are cages that require available information to be fit as metadata only into the available slots, so we see:

1. **Coercion** of information into inappropriate categories;

2. **Reticence** in providing information we were not sure about, or for which no appropriate category exists;

3. **Dumping** of complex information into descriptive fields in a free format, without appropriate categorization and without structure.

Much information that could be represented in much finer details is lost.

An example

- *An Europeana record*

An example

- *An old view (2012) of an Europeana record*

Reticence
Lots of information missing

???

Coercion
These are not real subjects

View item at
Bildarchiv Foto Marburg

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Format: Höhe x Breite: 14 x 26,9 cm (Platte; mit der folgenden Radierung auf einem Blatt) ; Höhe x Breite: 53,9 x 41,3 cm (Blatt)

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DIE RÖMISCHEN ALTERTÜMER, WERK DES GIAMBATTISTA PIRANESI VENEZIANISCHER ARCHITEKT, AUFGETEILT IN VIER BÄNDEN — DIE RÖMISCHEN ALTERTÜMER I — Ansicht des flavischen Amphitheaters genannt Colosseum

Alternative Title: Veduta dell' Anfiteatro Flavio detto il Colosseo

Creator: Gravier (Verlag (Erstausgabe)) | ▸ Piranesi, Giovanni Battista (Radierer, Inventor) | ▸ Rom [kultureller Kontext] [Herstellung] | ▸

Date: 1756 [Veröffentlichung] ; 1787 [Veröffentlichung]

Type: Druck | ▸ Druckgraphik | ▸

Subject: Caulfield, James (Charlemont, Lord) | ▸ Gustaf (Schweden, König, 3) | ▸

Relation: Kurzbeschreibung: DIE RÖMISCHEN ALTERTÜMER I - Band - Piranesi, Giovanni Battista u.a. - Gravier - 1756 [http://www.bildindex.de/dokumente/html/obj20089555]

Description: Inschrift: Numerierung: oben links — Tav. XXXVII [Beschreibung]

Inschrift: Numerierung: oben rechts — Fig. I [Beschreibung]

Inschrift: Signatur: unten rechts — Piranesi Architett. dis. inc. [Beschreibung]

See more ▸

Data provider: Bildarchiv Foto Marburg | ▸

Provider: Athena | ▸ Germany | ▸

Explore further!

A different record of the same

- *Another record of the same item (2012 - disappeared now)*

Amphitheatrum Flavium / Colosseum

Date: 70/80 [Herstellung]

Type: Amphitheater | ▸ Architektur | ▸

Relation: Kurzbeschreibung: Außenbau - Fassade, Rom - 70/80
[http://www.bildindex.de/dokumente/html/obj99158298] ; Kurzbeschreibung: äußerer
Umgang - Umgang, Rom - 70/80
[http://www.bildindex.de/dokumente/html/obj99158298] ; Kurzbeschreibung: Arena -
Arena, Rom - 70/80 [http://www.bildindex.de/dokumente/html/obj99158298] ;
Kurzbeschreibung: Umgang im Inneren - Umgang, Rom - 70/80
[http://www.bildindex.de/dokumente/html/obj99158298]

Description: Aufbewahrung/Standort: Rom

Datierung des Fotos: um 1960/1970

Fotograf: Helbig, Konrad

Fotoinhalt/Ansicht: "Veduta dell'Anfiteatro Flavio detto il Colosseo", Kupferstich aus:
Le Antichita Romane, opera di Giambattista Piranesi (1720-1778), Band I. Rom
1756, Tafel XXXVII

See less ▲

Data provider: Bildarchiv Foto Marburg | ▸

Provider: Athena | ▸ Germany | ▸

Explore further!

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Marburg / Helbig, Konrad [Digitales
Bild (retrodigitalisiert)]

...ore ...e Deutsches
...mentationszentrum für
...geschichte - Bildarchiv Foto
...urg | ▸

Dumping
Description contains
lots of interesting data

How do text and structured metadata differ?

Wikipedia
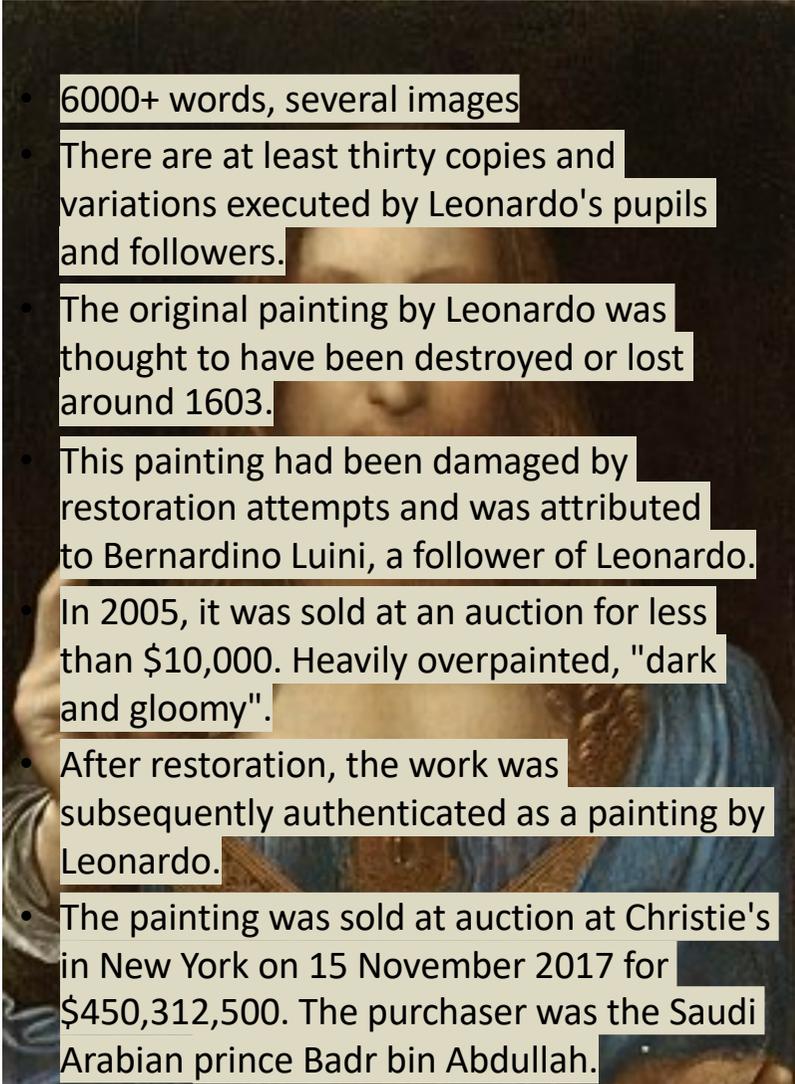
- 6000+ words, several images
- There are at least thirty copies and variations executed by Leonardo's pupils and followers.
- The original painting by Leonardo was thought to have been destroyed or lost around 1603.
- This painting had been damaged by restoration attempts and was attributed to Bernardino Luini, a follower of Leonardo.
- In 2005, it was sold at an auction for less than $10,000. Heavily overpainted, "dark and gloomy".
- After restoration, the work was subsequently authenticated as a painting by Leonardo.
- The painting was sold at auction at Christie's in New York on 15 November 2017 for $450,312,500. The purchaser was the Saudi Arabian prince Badr bin Abdullah.

Wikidata
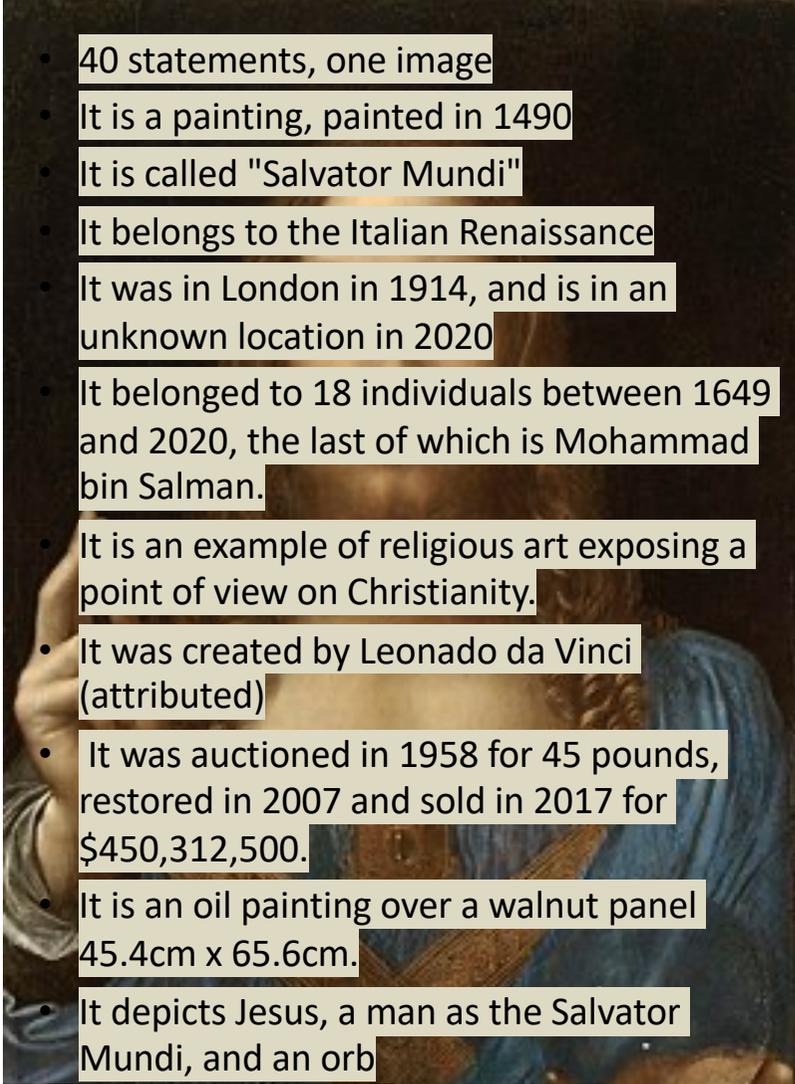
- 40 statements, one image
- It is a painting, painted in 1490
- It is called "Salvator Mundi"
- It belongs to the Italian Renaissance
- It was in London in 1914, and is in an unknown location in 2020
- It belonged to 18 individuals between 1649 and 2020, the last of which is Mohammad bin Salman.
- It is an example of religious art exposing a point of view on Christianity.
- It was created by Leonado da Vinci (attributed)
- It was auctioned in 1958 for 45 pounds, restored in 2007 and sold in 2017 for $450,312,500.
- It is an oil painting over a walnut panel 45.4cm x 65.6cm.
- It depicts Jesus, a man as the Salvator Mundi, and an orb

ORUM
OGNA

Facts. Just facts. Boring facts.

- No uncertainties (except attribution and location, only mentioned and not explored)
- A much shorter story
- No details, no depth
- Mostly boring administrative details

A (short) review of approaches to expressing uncertainties in metadata

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A special situation: uncertainty

There might be information we are not sure about:

- Ignorance
  - temporary ignorance: metadata needs to evolve
  - permanent ignorance: admit lack of information
- Evolving data
- Disagreement
- Challenges

What to do with these situations?

Reticence seems the wrong choice.

Semantic web technologies

- RDF – Resource Description Framework
    - Simple, extremely deconstructed and fragmented statements in the form of triples of Subject Predicate Object.
    - All of them are uniquely identified (using URIs)
    - RDF 1.0: simple conceptual model of plain statements
    - RDF 1.1: adds Named Graphs as containers of statements
    - Serializations: Turtle, Trig

- OWL – Web Ontology Language
    - Representing correctness constraints for subjects, predicates and objects (ontologies).
    - Very complex and powerful, very formal.

- SPARQL – RDF query language
    - search language based on specific types and values for selecting triples according to specific criteria.

A non-uncertain attribution (1)

Text

Wikipedia: "Of Leonardo da Vinci's works, the *Mona Lisa* is the only portrait whose authenticity has never been seriously questioned."

Dublin Core metadata

```
:MonaLisa rdfs:label "Mona Lisa".
:LeoDaVinci rdfs:label "Leonardo Da Vinci".
:MonaLisa dc:creator :LeoDaVinci.
```

Read it as:

"Mona Lisa" was created by "Leonardo da Vinci".

Notes:

:MonaLisa : an identifier associated to a specific real-life object

:LeoDaVinci: an identifier associated to a specific real-life person

dc:creator : the property describing authorship according to the Dublin Core ontology

A non-uncertain attribution (2)

Text

Wikipedia: "Of Leonardo da Vinci's works, the *Mona Lisa* is the only portrait whose authenticity has never been seriously questioned."

Wikidata metadata

```
wd:Q12418 rdfs:label "Mona Lisa".
wd:Q762 rdfs:label "Leonardo Da Vinci".
wd:Q12418 wdt:P170 wd:Q762.
wdt:P170 rdfs:label "creator"@en ;
```

Read it as:

"Mona Lisa" has creator "Leonardo da Vinci".

Notes:

Q12418 : an identifier associated to Mona Lisa

Q762: an identifier associated to Leonardo da Vinci

P170 : the identifier of the property describing authorship according to the Wikidata ontology

An uncertain attribution (1)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

Dublin Core metadata

```
:Salvator dc:creator :LeoDaVinci.
:Salvator dc:creator :Salai.
:Salvator dc:creator :Boltraffio.
```

Read it as:

"Salvator Mundi" was created by "Leonardo da Vinci", by "Salai" and by "Boltraffio"

Notes:

Simple metadata models cannot allow multiple competing statements, of which at most one can be true.

An uncertain attribution (2)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

Wikidata metadata *(as is)*

① wd:Q1892745 wdt:P170 wd:Q762.
② wd:Q1892745 p:P170 s:S1.
③ s:S1 a wikibase:Statement;
        wikibase:rank wikibase:BestRank;
        ps:P170 wd:Q762;   # Leonardo
        pq:P5102 wd:Q230768.   # attribution

Read it as:

① *"Salvator Mundi" was created by "Leonardo da Vinci", and* ② *it is associated to a statement S1 saying that* ③ *«being created by "Leonardo da Vinci"» is limited to being an attribution.*

Notes:

- Wikidata asserts the fact, and then repeats it with a limiting qualification (i.e., it is only an attribution)
- There is no mention of either Alaì or Boltraffio.
- Wikidata uses prefixes in a fairly creative way...

An uncertain attribution (3)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

Wikidata metadata *(as it could be)*

① wd:Q1892745 wdt:P170 wd:Q762.
② wd:Q1892745 p:P170 s:S1.
③ s:S1 a wikibase:Statement;
      wikibase:rank wikibase:BestRank;
      ps:P170 wd:Q762;   # Leonardo
      pq:P5102 wd:Q230768.   # attribution
④ wd:Q1892745 p:P170 s:S2.
⑤ s:S2 a wikibase:Statement;
      wikibase:rank wikibase:DeprecatedRank;
      ps:P170 wd:Q954126;   # Salai
      ps:P170 wd:Q442528 ;   # Boltraffio
      pq:P5102 wd:Q230768.   # attribution

Read it as:

① *"Salvator Mundi" was created by "Leonardo da Vinci", and* ② *it is associated to a statement S1 saying that* ③ *«being created by "Leonardo da Vinci"» is the best choice of all attributions, and* ④ *it is associated to statement S2 saying that* ⑤ *«being created by "Salaì" and "Boltraffio"» is a deprecated choice as attribution.*

Wikidata and complex statements

- Although cumbersome, Wikidata has a way to represent debated statements.
  - Best rank are statement that are either preferred if one exists, or normal rank otherwise
  - Preferred rank are statements that best represent consensus (scientific or community consensus);
  - Normal rank are statements that are not expected to be in competition with anything else, and therefore asserted by default
  - Deprecated rank are statements that are known to include errors or that represent outdated knowledge
- Unfortunately, deprecated and preferred statements are less that 1% out of all statements in Wikidata.
- Additionally, most of them represent basically corrections of typos, changes in location of inventory number.
- Additionally, Wikidata has a way to represent provenance (not mentioned here)

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Other ways to represent uncertainties

Use Reification (RDF 1.0)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

Reification + Dublin Core

:S1 a rdf:Statement.
:S1 rdf:Subject :Salvator.
:S1 rdf:Predicate dc:creator.
:S1 rdf:Object :LeoDaVinci.
:S1 prov:wasAttributedTo :MartinKemp.
:S2a a rdf:Statement.
:S2a rdf:Subject :Salvator.
:S2a rdf:Predicate dc:creator.
:S2a rdf:Object :Salai.
:S2b a rdf:Statement.
:S2b rdf:Subject :Salvator.
:S2b rdf:Predicate dc:creator.
:S2b rdf:Object :Boltraffio.
:S2a prov:wasAttributedTo :JacquesFranck.
:S2b prov:wasAttributedTo :JacquesFranck.

Read it as:

S1 is a statement whose subject is "Salvator Mundi", whose predicate is "being created by", whose object is "Leonardo Da Vinci".

S1 is attributed to "Martin Kemp".

S2a is a statement whose subject is "Salvator Mundi", whose predicate is "being created by", whose object is "Salai". S2b is a statement whose subject is "Salvator Mundi", whose predicate is "being created by", whose object is "Boltraffio".

S2a and S2b are attributed to "Jacques Franck".

Use an ontology (CIDOC-CRM)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

CIDOC-CRM

:Salvator a crm:E24_Physical_Human-Made_Thing .

:P1 a crm:E12_Production ;
    crm:P108_has_produced :Salvator.

:A1 a crm:E13_Attribute_Assignment ;
    crm:P177_assigned_property_of_type crm:P14_carried_out_by ;
    crm:P140_assigned_attribute_to :P1 ;
    crm:P141_assigned :LeoDaVinci
    crm:P14_carried_out_by :MartinKemp .

:A2 a crm:E13_Attribute_Assignment ;
    crm:P177_assigned_property_of_type crm:P14_carried_out_by ;
    crm:P140_assigned_attribute_to :P1;
    crm:P141_assigned :Salai;
    crm:P141_assigned :Boltraffio;
    crm:P14_carried_out_by :JacquesFranck.

Read it as:

"Salvator Mundi" is a man-made thing. A production event P1 exists that produced "Salvator Mundi".

An attribution activity A1 exists, about the entity that carried out the production event P1, which is associated to "Leonardo Da Vinci", according to Martin Kemp.

An attribution activity A2 exists, about the entity that carried out the production event P1, which is associated to "Salai" and "Boltraffio", according to Jacques Kamp.

Use Named Graphs (RDF 1.1)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

Named Graph + Dublin Core

GRAPH :S1 {
    :Salvator dc:creator :LeoDaVinci.
}
:S1 prov.wasAttributedTo :MartinKemp.
GRAPH :S2 {
    :Salvator dc:creator :Salai.
    :Salvator dc:creator :Boltraffio.
}
:S1 prov:wasAttributedTo :JacquesFranck.

Read it as:

"Salvator Mundi" was created by "Leonardo Da Vinci" according to "Martin Kemp". "Salvator Mundi" was created by "Salai" and "Boltraffio" according to "Jacques Franck".

We are good now, are we?

Use Named Graphs (RDF 1.1)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

Named Graph + Dublin Core

:S1 {
      :Salvator dc:creator :LeoDaVinci.
}
:S1 prov:wasAttributedTo :MartinKemp.
:S2 {
      :Salvator dc:creator :Salai.
      :Salvator dc:creator :Boltraffio.
}
:S1 prov:wasAttributedTo :JacquesFranck.

This is not the correct reading:

"Salvator Mundi" was created by "Leonardo Da Vinci" according to "Martin Kemp". "Salvator Mundi" was created by "Salai" and "Boltraffio" according to "Jacques Franck".

Rather read it as:

"Salvator Mundi" was created by "Leonardo Da Vinci"***, and this is*** according to "Martin Kemp". "Salvator Mundi" was created by "Salai" and "Boltraffio"***, and this is*** according to "Jacques Franck".

The difference is striking: both attributions are asserted, and the provenance specification is just an addition

Use RDF-star

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

RDF-star + Dublin Core

<< :Salvator dc:creator :LeoDaVinci. >>
    prov.wasAttributedTo :MartinKemp.
<< :Salvator dc:creator :Salai. >>
    prov:wasAttributedTo :JacquesFranck.
<< :Salvator dc:creator :Boltraffio.>>
    prov:wasAttributedTo :JacquesFranck.

Read it as:

The statement «"Salvator Mundi" was created by "Leonardo Da Vinci"» is attributed to "Martin Kemp".

The statement «"Salvator Mundi" was created by "Salai"» is attributed to "Jacques Franck".

The statement «"Salvator Mundi" was created by "Boltraffio"» is attributed to "Jacques Franck".

Notes:
The statements are not asserted. This is good.
In order to assert a statement, you repeat it outside of the quote.
Each statement is on its own: multiple attributions (e.g., Salai and Boltraffio) are independently quoted and attributed. This is not good.

Issues in uncertainty models

All the examples shown have problems

- Secondary entities (e.g., statements, activities, events, etc.).
- Many more statements than apparently necessary
- Hard to decide which statements are asserted (presented as true) and which are only expressed (no truth value associated)

- Ontologies further show a large number of overly-specialized entities for all non-trivial situations.

- They make representations more complex, more indirect, involving more statements, whose truths states are hard to determine.

- Searching for uncertainties, ambiguities and complex situations are exceedingly complicated.

Conjectures

- Our proposal (2021)
- A specialization of Named Graph that, by construction, DOES NOT ASSERT its content.
- Divides statements in three categories:
    1. ***undisputed***: no-one has so far doubted the truth of a claim. However, this does not imply the claim is true.
    Use plain RDF 1.1 Named Graphs
    2. ***disputed***: at least one known source puts doubts on the claim or provides competing and incompatible claims.
    Use Conjectural Graphs
    3. **settled**: while recognizing the existence of disagreement, the author of the dataset has chosen one of the claims against all other.
    Use Collapsed Conjectural Graphs.
- A complete formal model exists that shows that this is correct as an extension of RDF 1.1 (strong form) as well as within plain RDF 1.1 (weak form)

Strong form

GRAPH :C1 {
    :MonaLisa dc:creator :LeoDaVinci.
}
treated as undisputed (probably asserted)

CONJECTURE :C2 {
    :Salvator dc:creator :Salai.
}

treated as disputed (surely non-asserted)

COLLAPSED CONJECTURE :C3 {
    :Salvator dc:creator :LeoDaVinci.
}

treated as settled (surely asserted)

Conjectures

- Our proposal (2021)
- A specialization of Named Graph that, by construction, DOES NOT ASSERT its content.
- Divides statements in three categories:
  1. **undisputed**: no-one has so far doubted the truth of a claim. However, this does not imply the claim is true.
     Use plain RDF 1.1 Named Graphs
  2. **disputed**: at least one known source puts doubts on the claim or provides competing and incompatible claims.
     Use Conjectural Graphs
  3. **settled**: while recognizing the existence of disagreement, the author of the dataset has chosen one of the claims against all other.
     Use Collapsed Conjectural Graphs.

- A complete formal model exists that shows that this is correct as an extension of RDF 1.1 (strong form) as well as within plain RDF 1.1 (weak form)

Weak form

GRAPH :C1 {
    :MonaLisa dc:creator :LeoDaVinci.
}
treated as undisputed (probably asserted)

GRAPH :C2 {
    :Salvator C2:creator :Salai.
    C2:creator conj:isAConjecturalFormOf dc:creator.
}
treated as disputed (surely non-asserted)

GRAPH :C3 {
    :Salvator S1:creator :Salai.
    S1:creator conj:isAConjecturalFormOf dc:creator.
}
GRAPH :collapseOfC3 {
    :Salvator dc:creator :Salai.
    :collapseOfC3 conj:collapses :C3.
}
treated as settled (surely asserted)

Use Conjectures (our proposal)

Text

Wikipedia: "The leading Leonardo expert Martin Kemp said that he knew immediately the restored painting was the work of Leonardo." + "Jacques Franck attributes the painting to Salaì jointly with Boltraffio"

Conjectures + Dublin Core

CONJECTURE :C1 {
        :Salvator dc:creator :LeoDaVinci.
}
:C1 prov:wasAttributedTo :MartinKemp.
CONJECTURE :C2 {
        :Salvator dc:creator :Salai.
        :Salvator dc:creator :Boltraffio.
}
:C2 prov:wasAttributedTo :JacquesFranck.

Read it as:

"Salvator Mundi" was created by "Leonardo Da Vinci" according to "Martin Kemp"'s conjecture.

"Salvator Mundi" was created by "Salai" and "Boltraffio" according to "Jacques Franck"'s conjecture.

Further applications of conjectures

Temporal and geographical uncertainties

Text

Wikipedia: "It remains uncertain where Leonardo [Da Vinci] was born; the traditional account is that he was born in Anchiano, though it is still possible he was born in a house in Florence that Ser Piero almost certainly had."

Conjectures + DBPedia

COLLAPSED CONJECTURE :C1 {
    dbr:Leonardo_Da_Vinci dbo:birthPlace dbr:Anchiano;
            dbo:birthDate "1452-04-15"^^xsd:Date.
}
:C1 prov:wasAttributedTo dbr:tradition.

CONJECTURE :C2 {
    dbr:Leonardo_Da_Vinci dbo:birthPlace dbr:Florence;
            dbo:birthDate "1452"^^xsd:Year.
}

Read it as:

It is accepted that Leonardo da Vinci was born in Anchiano on April 15th 1452, according to tradition. Yet, an alternative conjecture exists according to which Leonardo da Vinci was born in Florence sometimes in 1452.

Evolving information

Text
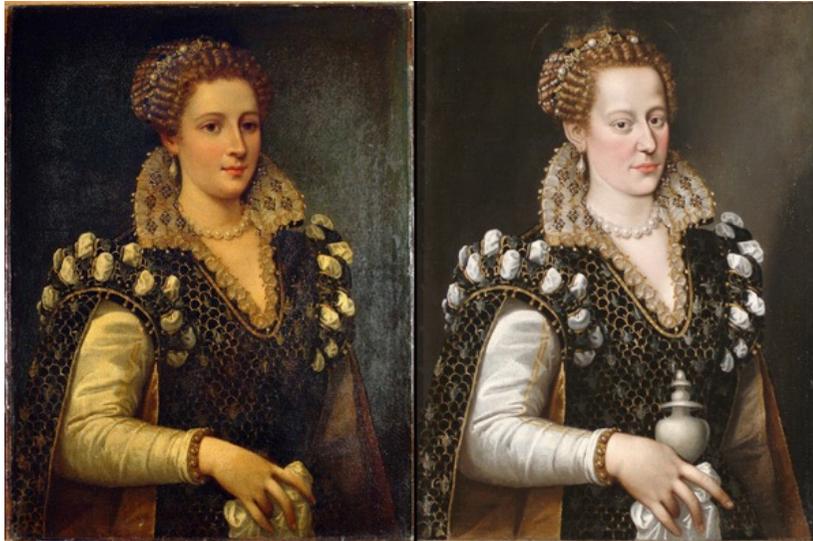
before.jpg   after.jpg

artnet.com: "Carnegie Museum of Art was convinced that a supposed 16th century Bronzino painting was a modern fake, and was ready to jettison the canvas from its collection, when conservators discovered that the work was authentic, but had received a dramatic makeover in the 19th century"

Conjectures + DBPedia

```
GRAPH :facts {
    :painting a dbo:ArtWork;
    dbr:Agnolo_Bronzino dbo:nickName "Bronzino".
    dbr:Alessandro_Allori dbo:nickName "Bronzino".
}
CONJECTURE :before {
    :painting dbo:depicts dbr:EleanorOfToledo;
        dbo:image "before.jpg" ;
        dbo:author dbr:Agnolo_Bronzino;
}
:before time:before "2013"^^xsd:Year .
COLLAPSED CONJECTURE :after {
    :painting dbo:depicts dbr:IsabellaDeMedici;
        dbo:image "after.jpg" ;
        dbo:author dbr:Alessandro_Allori;
        dbo:date "1572"^^xsd:Date.
}
:after time:after"2013"^^xsd:Year .
```

Read it as:

Before 2013, it was believed that the painting shown in image "before.jpg" represented Eleanor of Toledo and had been painted by Bronzino (Agnolo Bronzino).

Since 2013, it is now known that the same painting, shown in image "after.jpg", depicts Isabella de Medici, and had been painted in 1572 by Bronzino (Alessandro Allori).

Evolving information

Evolving interpretation

Text

before.jpg   *after.jpg*

artnews.com: "The painting *Girl Reading a Letter at an Open Window* (ca. 1657) by Jan Vermeer depicts a pensive lady while reading a letter. A white wall is behind her. Traditionally, the work was mildly associated to the idea of love. In 2021, after a complete restoration, the a portray of Cupid trampling on a mask (symbol of hypocrisy) was unveiled, and a new interpretation of the painting was adopted, love overcoming treachery and hypocrisy"

Conjectures + DBPedia

GRAPH :facts {
    :GirlReadingaLetter a dbo:ArtWork;
        dbo:author dbr:JanVermeer;
        dbo:title "Girl Reading a Letter at an Open Window"
    :restoration a prov:Activity;
        prov:used :GirlReadingaLetter;
        prov:AtTime "2021"^^xsd:Year. }
CONJECTURE :beforeRestoration {
    :GirlReadingaLetter dbo:depicts :girl, :letter, :window;
        dbo:represents :love;
        dbo:image "before.jpg" ; }
:before time:before :restoration.
COLLAPSED CONJECTURE :after {
    :GirlReadingaLetter dbo:depicts :girl, :letter, :window, :cupid, :masks;
        dbo:image "after.jpg" ;
        dbo:represents :loveOvercomingTreachery. }
:after prov:wasGeneratedBy :restoration.

Read it as:

The painting "Girl Reading a Letter at an Open Window" by Jan Vermeer was restored in 2021. Before the restoration, the painting, shown in image before.jpg, depicted a girl, a letter and a window, and was interpreted as representing love.

After the restoration, the painting, shown in image after.jpg, depicts a girl, a letter, a window, a cupid and masks. It is interpreted as representing love overcoming treachery.

Evolving interpretation

Before restoration

After restoration

Competing interpretations

Text

"In 1993 an Italian pop singer, Albano Carrisi, sued megastar Michael Jackson for plagiarism, claiming that the song ``Will you be there" by Jackson (1993) was derived from Carrisi's ``I cigni di Balaka" (1987). After a first ruling in favour of Carrisi, Jackson's lawyers appealed and claimed that a much older tune, ``Bless You for Being an Angel" by the Ink Spots (1939), already out of copyright, was the source of both songs. The judge ruled in favour of Jackson and the ruling staid."

Conjectures + DBPedia

```
CONJECTURE :carrisiStatements {
      :cigniDiBalaka a dbo:Song;
            dbo:recorded "1987"^^xsd:Date;
      :willYouBeThere a dbo:Song;
            dbo:recorded "1993"^^xsd:Date.
      :willYouBeThere dbo:InfluencedBy :cigniDiBalaka ;
}
:carrisiStatement prov:wasAttributedTo :AlbanoCarrisisLawyers.
CONJECTURE :jacksonStatements {
      :cigniDiBalaka a dbo:Song;
            dbo:recorded "1987"^^xsd:Date;
      :willYouBeThere a dbo:Song;
            dbo:recorded "1993"^^xsd:Date.
      : blessYouForBeingAnAngel a dbo:Song;
            dbo:recorded "1939"^^xsd:Date.
      :cigniDiBalaka dbo:InfluencedBy :blessYouForBeingAnAngel .
      :willYouBeThere dbo:InfluencedBy :blessYouForBeingAnAngel .
}
:jacksonStatement prov:wasAttributedTo :MichaelJacksonsLawyers.
COLLAPSED CONJECTURE :judgeVerdict{
      :judgeDecision a dbo:judgment
                      conj:collapses :jacksonStatement .
}
:judgeDecision prov:wasAttributedTo :AppellateCourtOfMilan .
```

Competing interpretations

Text

"In 1993 an Italian pop singer, Albano Carrisi, sued megastar Michael Jackson for plagiarism, claiming that the song ``Will you be there'' by Jackson (1993) was derived from Carrisi's ``I cigni di Balaka'' (1987). After a first ruling in favour of Carrisi, Jackson's lawyers appealed and claimed that a much older tune, ``Bless You for Being an Angel'' by the Ink Spots (1939), already out of copyright, was the source of both songs. The judge ruled in favour of Jackson and the ruling staid."

Conjectures + DBPedia

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    :cigniDiBalaka a dbo:Song;
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    :willYouBeThere dbo:InfluencedBy :cigniDiBalaka ;
}
:carrisiStatement prov:wasAttributedTo :AlbanoCarrisisLawyers.
CONJECTURE :jacksonStatements {
    :cigniDiBalaka a dbo:Song;
        dbo:recorded "1987"^^xsd:Date;
```

Read it as:

According to Albano Carrisi's lawyers, the song "I cigni di Balaka" was recorded in 1987, while the song "Will You Be There" was recorded in 1993, and "Will You Be There" was influenced by "I cigni di Balaka".

According to Michael Jackson's lawyers, the song "I cigni di Balaka" was recorded in 1987, while the song "Will You Be There" was recorded in 1993, and the song "Bless You for being an Angel" was recorded in 1939, and both "Will You Be There" and "I cigni di Balaka" " were influenced by "Bless you for Being and Angel".

The Appellate Court of Milan created a Judgment that adopted the opinions of Michael Jackson's lawyers.

Conclusions...

- Facts are easy.

- Facts are boring.

- Facts are few, and only a minimal part of what we want to know and remember.

- Doubts, opinions, disputes, disagreements and debates are not yet easy to represent formally in metadata collections.

- Cultural heritage experts and professionals must call for adequate formalisms and tools

- Increasing the quality and quantity of digital collections with non-objective facts is an important objective for our future

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Fabio Vitali

Dipartimento di Informatica – Scienze e Ingegneria
Alma mater – Università di Bologna

Fabio.vitali@unibo.it