Conjectures: using RDF in critical discourse in the humanities

Marilena Daquino and **Valentina Pasqual** and **Francesca Tomasi** and **Fabio Vitali**
University of Bologna, Italy
marilena.daquino2,valentina.pasqual2,
francesca.tomasi,fabio.vitali@unibo.it

Abstract

In this article we examine the need and usefulness of expressing without asserting (EWA) arbitrary claims as RDF named graphs. We narrow the problem of EWA in humanities discourse, we survey the state of the art, finally we propose our solution, *Conjectures*, to express and retrieve statements whose truth value is not specified and we apply it to a use case scenario.

1 Introduction and problem statement

Critical discourse in the humanities is characterised by subjectivity and uncertainty of interpretations, most frequently leading to concurring and incompatible statements about the same concepts or facts due to different viewpoints and sources. Complexities abound: on the one hand, uncertainty spans across a wide range of disciplines (from iconography to art, from philology to paleography, etc.), on the other hand it needs to be considered about an equally ample variety of analyses (from the hermeneutic analysis of an painting to the construction of a critical apparatus for a manuscript, etc.) (Piotrowski, 2019).

The formal representation of these differences is open to debate. Several models have been designed for Semantic Web expression of assertions annotated with information about provenance and confidence. Still, they are not sufficiently expressive to represent uncertain statements without asserting them.

Our contribution, Conjectures, aims to be an ontology-independent solution for *EWA (Expressing Without Asserting)* statements, i.e., to explicitly represent claims that should not be interpreted as facts (i.e., as assertions) through the use of Semantic Web technologies.

2 State of the art

The role of Digital Humanities in the representation of uncertainty from a theoretical perspective has been tackled by (Piotrowski, 2019; Piotrowski and Neuwirth, 2020; Daquino et al., 2020; Daquino and Tomasi, 2015), marking uncertainty as some form of incompleteness in information that cannot be understood as non-knowledge, but as part of interpretation. Several contributions dealt with similar issues from a practical point of view (van den akker et al., 2011; Maiatsky et al., 2018; Daquino et al., 2020) and spanning trough different disciplines. In many cases, solutions for uncertainty seems to be tailored to the context of specific research project and no agreement on a general strategy has been found.

At an ontological level, CIDOC CRM - the official standard for Cultural Heritage descriptions (Doerr et al., 2007) - somehow addresses the representation of concurring opinions over the same topic. Linked Art (Page et al., 2020), some CIDOC CRM extensions (Doerr et al., 2014; Doerr and Theodoridou, 2011; Niccolucci and Hermon, 2017) and ANON (Daquino and Tomasi, 2015), were created to represent meta-knowledge related to possible concurring statements. Existing Semantic Web approaches focus around reification, n-ary relations (Noy et al., 2006), singleton properties (Nguyen et al., 2014), RDF-star (Hartig, 2017), named graphs (Carroll et al., 2005), all of which provide syntactic extensions and enable statement-level descriptions, allowing the expression of provenance and confidence information. Still, in most cases, these methods are not sufficiently expressive to represent uncertain statements without asserting them at the same time, and they often require many additional triples to represent the issue at hand.

3 Use Case

Consider the scenario discussed in (Charman and Ross, 2006). "The Methodologies of Art" by Laurie Schneider Adams refers to a commentary in Jacques Derrida's "The Truth in Painting", recording two interpretations of Van Gogh's painting

Shoes, 1886 (Van Gogh Museum, Amsterdam) as uttered by two authoritative sources. Martin Heidegger describes a peasant woman who wears the shoes "imagining her 'uncomplaining' in the face of difficulties"(Charman and Ross, 2006). Meanwhile, Meyer Shapiro describes the shoes as a 'sacred relic' with autobiographical significance. In addition, Derrida supports Shapiro's point of view and notes that Heidegger statement is aimed at supporting a particular ideology. The scenario illustrates two concurring interpretations whose truth value cannot be asserted as facts. An ontology-independent solution to represent this phenomenon is needed to prevent information loss and to simplify retrieval of data and context information.

4 Proposal

The motivation driving this work is to have the possibility to make claims that must not be interpreted as facts). Conjectures, designed in two notations, *weak* and *strong* forms, is a simple yet innovative way to explicitly represent without asserting RDF named graphs whose truth value is unknown (e.g. hypotheses, competing or contradictory claims, points of view we agree or disagree with, even absurdities) (Barabucci et al., 2021).

The *weak* notation is an RDF 1.1 compliant approach to express without asserting statements inside named graphs. Similarly to singleton properties, newly minted predicates are created for each statement of the named graph, and it is associated to its original predicate through a `conj:isAConjecturalFormOf` triple. Differently from singleton properties, `conj:isAConjecturalFormOf` is not a subproperty of `rdf:type`, hence the original statements are not asserted, as shown in listing 1.

Listing 1: Concurring statements about *Shoes* in weak form

```
:interpretation1 {
    :painting conj0001:depicts   :female_shoes.
    :painting conj0001:symbolOf :uncomplaining.
    conj0001:depicts   conj:isAConjecturalFormOf :depicts.
    conj0002:symbolOf conj:isAConjecturalFormOf :symbolOf.
}
:interpretation1 :author :MartinHeidegger.

:interpretation2 {
    :painting conj0002:depicts   :male_shoes;
    :painting conj0002:symbolOf :autobiography.
    conj0002:depicts   conj:isAConjecturalFormOf :depicts.
    conj0002:symbolOf conj:isAConjecturalFormOf :symbolOf.
}
:interpretation2 :author :MeyerShapiro.
```

This approach has some immediate benefits. Normally, a reasoner would interpret competing statements as either being the same (e.g., `:female_shoes` and `:male_shoes` are actually the same entity) or concurring (e.g., the painting depicts both `:female_shoes` and `:male_shoes`). This limit is totally avoided with conjectures, since no `:depicts` triple is asserted. In their stead, we assert two separate triples, using two new predicates `conj0001:depicts` and `conj0002:depicts`, which are *a conjectural form* of `:depicts`, but *are not* `:depicts`. This provides a way for expressing without asserting triples in a machine-understandable manner, avoiding the need for human intervention to disambiguate statements.

Since conjectures are RDF 1.1 compliant, they can be queried with plain SPARQL. For instance, a simple SPARQL query can return all disputed interpretations of the painting as shown in listing 2.

Listing 2: Retrieve all concurring interpretations about depictions (e.g *Shoes*)

```
SELECT DISTINCT ?conj
WHERE {
  GRAPH ?conj {
    ?painting ?conjpredicate ?object .
    ?conjpredicate conj:isAConjecturalFormOf :depicts . }}
```

Conjectures can be equally expressed in a *strong form*, a non-alternative, more concise syntactic solution in which we replace keyword `GRAPH` with `CONJECTURE` for conjectural graphs, while being able to maintain the original predicates inside.

Listing 3: Concurring statements about *Shoes* in strong form

```
CONJECTURE :interpretation1 {
  :painting :depicts :female_shoes ;
  :symbolOf :uncomplaining .
}
:interpretation1 :author :MartinHeidegger .

CONJECTURE :interpretation2 {
  :painting :depicts :male_shoes ;
  :symbolOf :autobiography .
}
:interpretation2 :author :MeyerShapiro .
```

In addition to purely unasserted conjectures, our proposal also include syntax to reassert conjectural graphs (*collapsed conjectures*: *A states X, B states Y, and we side with A*), to conjecture conjectures (*C states that D states Z*), and to conjecture collapses (*E states that F sides with A*).

5 Conclusion

In this contribution we address the issue of expressing uncertain statements without asserting them in critical discourse by providing Conjectures as a practical solution. Conjectures revise the intuition of singleton properties of using newly minted predicates (no reification takes place), but uses them

avoiding the assertion of the original triple. Strong and weak forms aim to provide two (non alternative) solutions to EWA, preventing technological barriers in their adoption. The full semantics of Conjectures is separately documented (Rolfini, 2021) and an online parser for the strong form has been created[1].

References

Gioele Barabucci, Francesca Tomasi, and Fabio Vitali. 2021. Supporting complexity and conjectures in cultural heritage descriptions. Accepted: 2021-04-09T06:42:33Z.

Jeremy J Carroll, Christian Bizer, Pat Hayes, and Patrick Stickler. 2005. Named graphs. *Journal of Web Semantics*, 3(4):247–267.

Helen Charman and Michaela Ross. 2006. Contemporary art and the role of interpretation: Reflections from tate modern's summer institute for teachers. *International Journal of Art & Design Education*, 25(1):28–41.

Marilena Daquino, Valentina Pasqual, and Francesca Tomasi. 2020. Knowledge representation of digital hermeneutics of archival and literary sources. *Knowledge Representation of digital Hermeneutics of archival and literary Sources*, pages 59–76.

Marilena Daquino and Francesca Tomasi. 2015. Historical context ontology (HiCO): A conceptual model for describing context information of cultural heritage objects. In *Metadata and Semantics Research*, pages 424–436. Springer International Publishing.

Martin Doerr, Athina Kritsotaki, Yannis Rousakis, Gerald Hiebel, and Maria Theodoridou. 2014. Crmsci: The scientific observation model.

Martin Doerr, Christian-Emil Ore, and Stephen Stead. 2007. The cidoc conceptual reference model: a new standard for knowledge sharing. In *Tutorials, posters, panels and industrial contributions at the 26th international conference on Conceptual modeling-Volume 83*, pages 51–56.

Martin Doerr and Maria Theodoridou. 2011. Crmdig: A generic digital provenance model for scientific observation. *TaPP*, 11:20–21.

Olaf Hartig. 2017. Foundations of rdf* and sparql*:(an alternative approach to statement-level metadata in rdf). In *AMW 2017 11th Alberto Mendelzon International Workshop on Foundations of Data Management and the Web, Montevideo, Uruguay, June 7-9, 2017.*, volume 1912. Juan Reutter, Divesh Srivastava.

Michail Maiatsky, Alexey Boyarsky, Natalia Boyarskaya, Ekaterina Velmezova, and Michael Piotrowski. 2018. Vicoglossia: Annotatable and commentable library as a bridge between reader and scholar (a proof of concept study: Early soviet philological culture). *Umanistica Digitale*, (2).

Vinh Nguyen, Olivier Bodenreider, and Amit Sheth. 2014. Don't like rdf reification? making statements about statements using singleton property. In *Proceedings of the 23rd international conference on World wide web*, pages 759–770.

Franco Niccolucci and Sorin Hermon. 2017. Expressing reliability with cidoc crm. *International Journal on Digital Libraries*, 18(4):281–287.

Natasha Noy, Alan Rector, Pat Hayes, and Chris Welty. 2006. Defining n-ary relations on the semantic web. *W3C working group note*, 12(4).

Kevin Page, Emmanuelle Delmas-Glass, David Beaudet, Samantha Norling, Lynn Rother, and Thomas Hänsli. 2020. Linked art: Networking digital collections and scholarship. In *DH*.

Michael Piotrowski. 2019. Accepting and modeling uncertainty. *Zeitschrift für digitale Geisteswissenschaften*.

Michael Piotrowski and Markus Neuwirth. 2020. Prospects for computational hermeneutics. In *Atti del IX Convegno Annuale AIUCD*.

Alessio Rolfini. 2021. Semantics of conjectures. *arXiv preprint arXiv:2110.08920*.

Chiel van den akker, Susan Legêne, Marieke Erp, Lora Aroyo, Roxane Segers, Lourens Meij, Jacco Van Ossenbruggen, Guus Schreiber, Bob Wielinga, Johan Oomen, and Geertje Jacobs. 2011. Digital hermeneutics: Agora and the online understanding of cultural heritage. *Journal of Automated Reasoning - JAR*.

[1] http://conjectures.altervista.org/