# Ontology for Analytic Claims in Music (OMAC)

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# Overview

**Part I:** Research context and OMAC ontology (main)

**Part II:** Insights on ontological analysis (brief)

**Conclusions** with final remarks

The Concert (1623) by Gerard van Honthorst

# **Part I:** Research context and OMAC ontology

# General research context

Semantic Web languages, models, and technologies:

- Used to handle musical data on the basis of an **explicit formal** treatment of domain experts' knowledge

See the paper for some references, as well as the following **Web repository**:

- MusoW - Musical Data on the Web: https://musow.kmi.open.ac.uk/ (by Enrico Daga et al.)

# From music to musicology

The world of music is highly heterogeneous:

- Different **types of entities** (musical compositions, scores, editions, performances, performing requirements, composers, performers, etc.)
- Different **genres**, **styles**, **cultures**, **historical periods**, etc.

It is becoming common for scholars to express:

- **Features** of musical entities like who is the composer of a composition, when a composition was composed, what are its performing requirements … but also …

- **Interpretations** (aka **observations**, **analytic claims)**. For example:
  - About authorship
  - About similarity
  - About date, etc.

# Our work

- To provide an ontology **of music for musicology** that represents both basic aspects of musical entities as well as scholarly analytic claims
- Main focus on: **Early Music** (1200-1600)*

In such a way to **represent** and **share** research results on Linked Data publishing platforms

Development and driving insights based on: **CRIM - Citations: The Renaissance Imitation Mass Project** (ACLS grant - American Council of Learned Societies)

CRIM

*Citations: The Renaissance Imitation Mass Project*

https://crimproject.org/

# Ontology for Analytic Claims in Music (OMAC)

**Some information:**

- Ontology Web Language (OWL; *some*, *only*, *cardinality*, *negation*, *property chains*)
- **Modular architecture**: 2 modules; to be further extended with specific modules depending on application settings

**Reuse existing resources**, e.g.:

- DBpedia ontology: for some classes and relations (e.g., dbp:birthPlace, etc.)
- Dublin Core: for annotations (e.g., dcterms:title, etc.)
- SKOS: for labeling (e.g., skos:prefLabel, etc.)
- VIAF: (testing) to populate the ontology with specific musical works and composers

**Available** on GitHub: https://github.com/HCDigitalScholarship/OMAC

# Competency questions (CQs)

Some CQs driving the development of the ontology:

Some common features of musical entities

- Who is the composer of musical work *x*?
- When was musical work *x* composed?
- Which authorial parts (sections and subsections) do *x* have (if any)?
- What are the performing forces of musical work *x*?

Analytic claims (relative to claim-classes in CRIM)

- Which analytic claims are about musical work x?
- What is the model for musical work x?
- What is the derivative of musical work x?
- What is the musical schema of analytic segment x?

# A quick note - Authorial Structure

- Musical **Work** (a whole composition), e.g.,
  - *Missa je suis desheritèe* (MJSD; by Jean Guyon) **[with sections and subsections]**
  - *Ite rime, dolenti* (Cipriano de Rore) **[with sections only]**
  - *Tota pulchra es* (by Claudin de Sermisy) **[no further decomposed]**

- Musical (authorial) **sections,** e.g.,:
  - *Kyrie_MJSD*, *Gloria_MJSD*, *Credo_MJSD*, *Sanctus_MJSD*, and *Agnus Dei_MJSD* (customary five liturgical sections of the Ordinary of the Catholic Mass)

- Musical (authorial) **subsections**, e.g.,:
  - A Kyrie has three subsections: *Kyrie1_MSJD*, *Christe_MSJD*, *Kyrie_MSJD*

# A quick note – Authorial Structure

**An example from Renaissance Paris:**

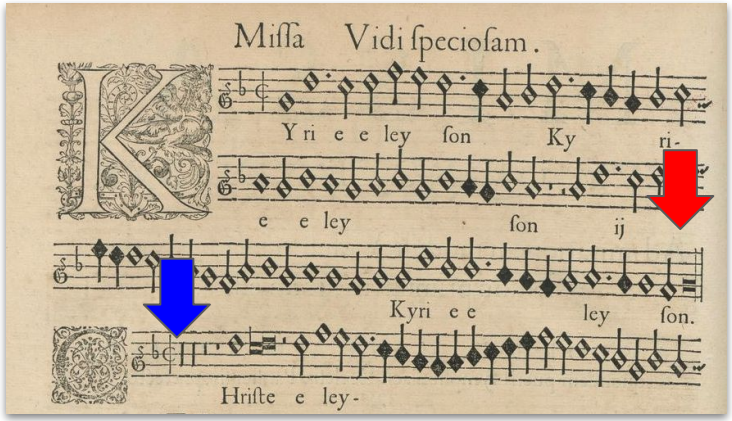
**Two sections** from the **first movement** (Kyrie) of the

*Missa Vidi speciosam*, by **Mathieu Sohier**.

They are distinct but inseparable parts of a single

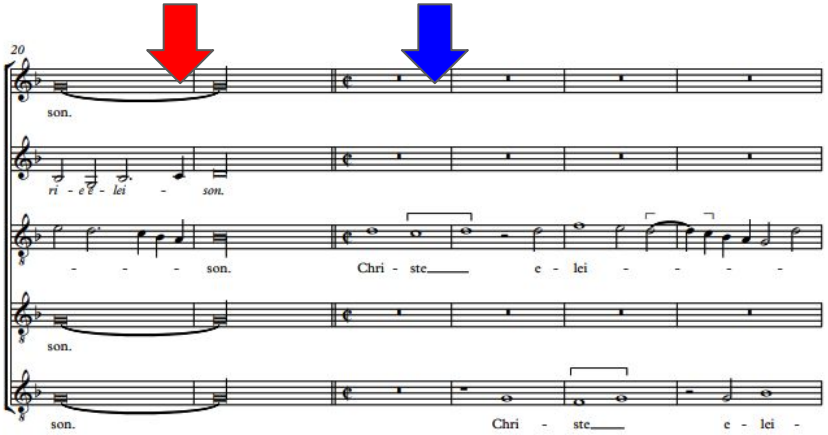
movement of a larger work.

Listen!




End of Kyrie

Beginning of Christe



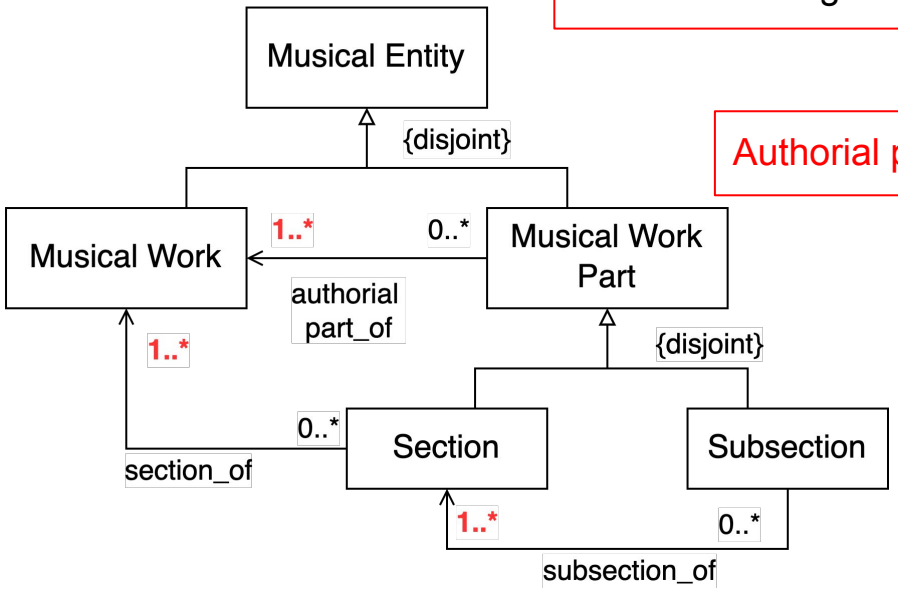
# **Musical Work Module** (partial view)

**Controversial** among music scholars whether the same authorial part can be related to **multiple** entities.

- We tend to think that this is **not** possible
- The **identity** of an authorial part is bound to a specific author/musical entity
- In principle, relations of **derivations** could be included to tell that, e.g., a section derives from another one

UML Class Diagram model

Authorial parts



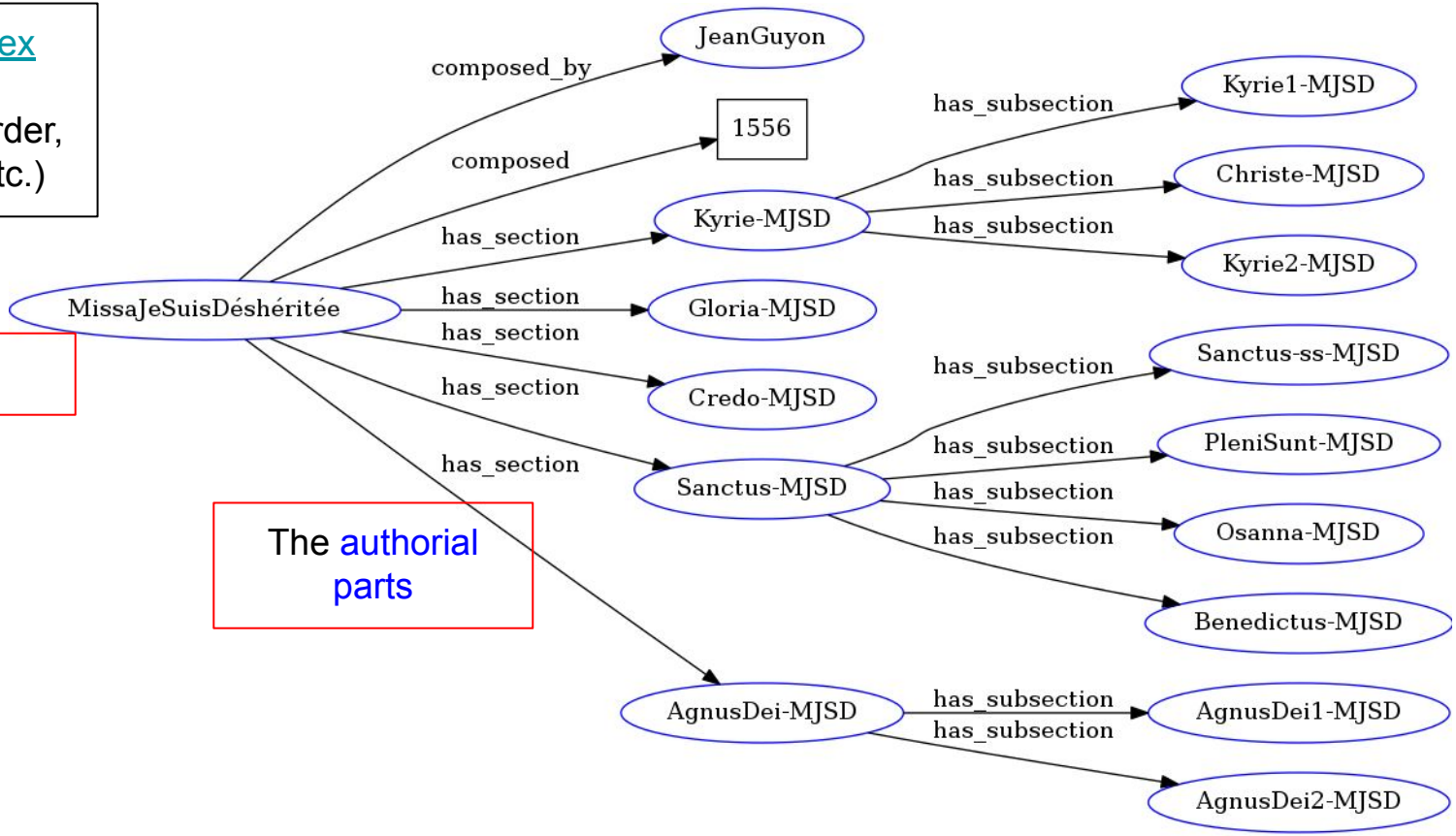

OWL 2 object property chains like:

- has section *o* has subsection → has subsection

At the current state, the ontology does **not** use cardinality restrictions for the authorial structure of musical entities (further refinements are needed)

# Example (1.) - RDF data graph (with authorial structure)

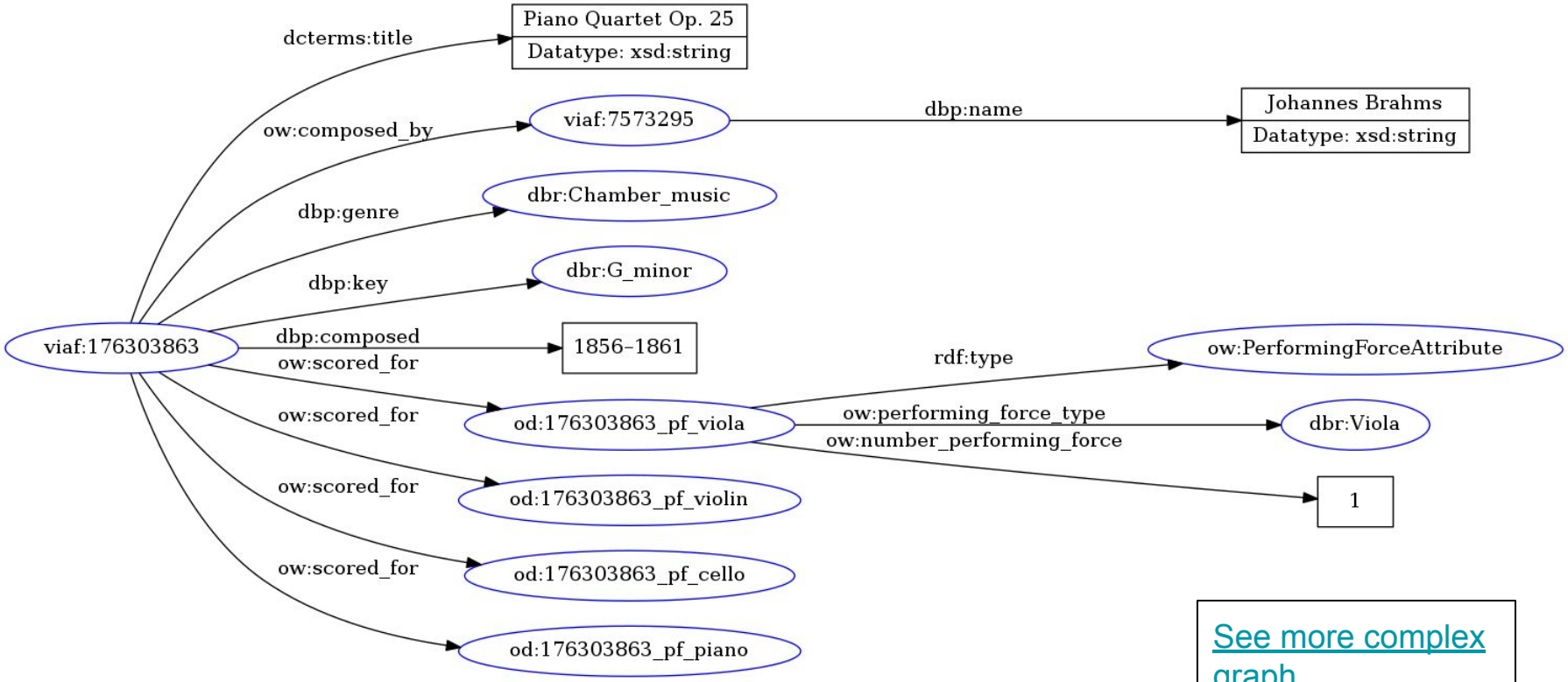
See more complex RDF graph (with genre, section order, viaf identifiers, etc.)




The mass

The authorial parts

# **Example (2.) - RDF data graph** (with performing forces)




[See more complex graph]

# Analytic Claims

Some aspects of claims:

- A claim represents the properties under which an entity is classified **by an agent** on the basis of certain procedures, research studies, background knowledge, socio-cultural contexts, etc. (how an entity is observed)
- Do not necessarily represent true facts (e.g., mistake in authorship attribution)

Also, there can be multiple claims about the same entities – expressed by different scholars (sometimes independently from each other). Hence, it is possible that claims:

- Are not compatible
- Contradict each other
- Represent information at different abstraction levels
- Are reviewed in time

Based on on-going work with Claudio Masolo and Roberta Ferrario

# Analytic Claims in CRIM

In the context of the CRIM project, musicologists focus on two types of claims:

- About structure
- About similarity

For some technical readings, see:

https://sites.google.com/haverford.edu/crim-project/vocabularies/musical-types

https://sites.google.com/haverford.edu/crim-project/vocabularies/relationship-types

# **A CRIM claim about structure** (partial view)

## Observation <11>

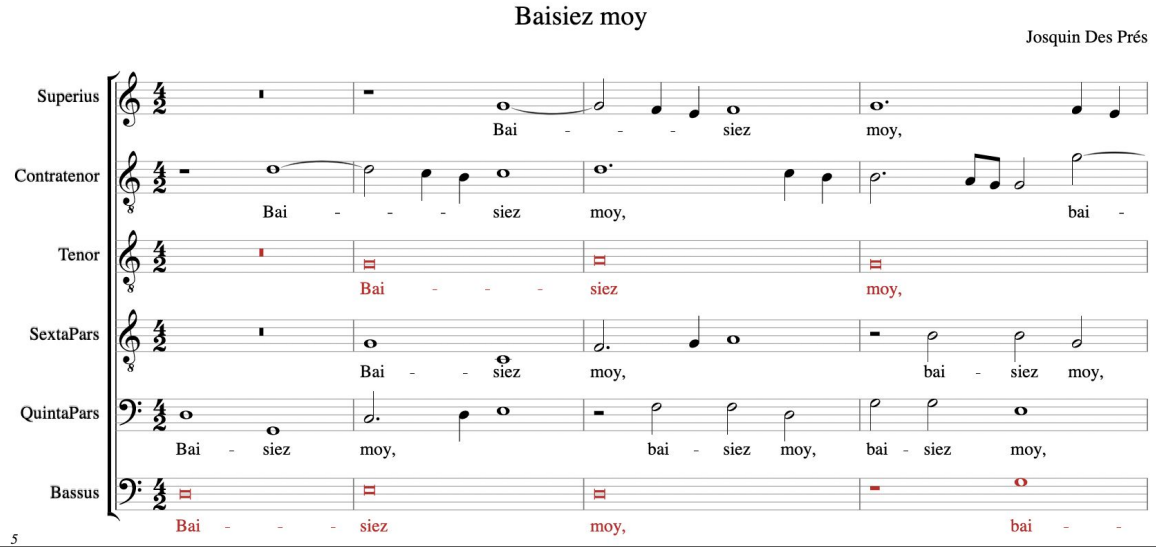
***Observer: David Fiala***

<R6> Mechanical transformation — Model for <12> Missa Baisez moy: Sanctus

***Score: Josquin Des Prés, Baisez moy***

Pattern type and attributes defined in the [CRIM Musical Types Vocabulary]

< start >




Fuga

**Voices:**
4: Bassus
3: Tenor

**Entry intervals:** 4+
**Time intervals:** B1
**Regularity:** Strict
**Inverted:** False
**Periodic:** False
**Retrograde:** False
**Sequential:** False

**See data here:** [https://crimproject.org/observations/11/]

# **A CRIM claim about similarity** (partial view)

## Relationship <R6>

***Observer: David Fiala***

Mechanical transformation

**Sounding in different voices:** True
**Melodically inverted:** False
**Retrograde:** False
**Metrically shifted:** True
**Transposition:** Transposed
**Double or invertible counterpoint:** False
**Systematic diminution:** -
**Systematic augmentation:** -
**Self:** -

***Model: Josquin Des Prés, Baisez moy***

***Derivative: Missa Baisez moy: Sanctus***

According to David Fiala, there is a similarity relation – of type Mechanical Transformation – between *Baisez moy* (by Josquin Des Prés) and the *Sanctus* section of the *Missa Baisez Moy* (by Mathurin Forestier)

See the CRIM Relationship Types Vocabulary

See **data** here: https://crimproject.org/relationships/6/

# **Claims in OMAC** (insights)

Representing claims requires considering at least:

- Agent (who), time (when), "content" (what)

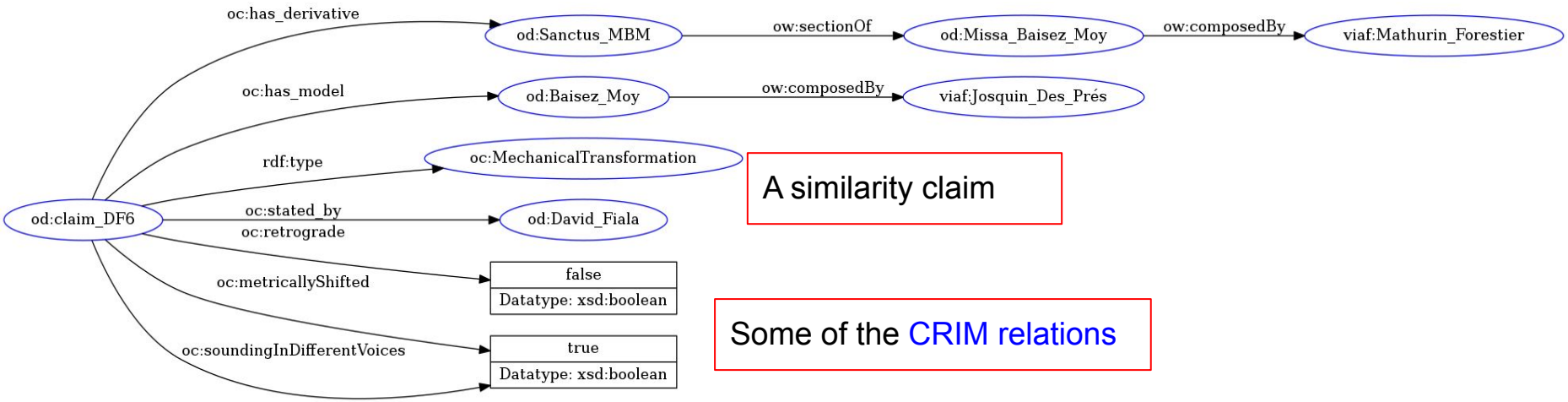
In OMAC:

- Claim (class)
- stated_by, refers_to (object properties); stated_at (data property)

**+** specific claim-classes/relations. E.g., SimilarityClaim (covers various subclasses):

- has_model, has_derivative + specific CRIM relations

# **RDF (data) graph about a similarity claim** (partial view)




A similarity claim

Some of the CRIM relations

OWL 2 object property chain like:
- model_in *o* has_derivative → model_for

Rules of this sort can be useful for query-answering (test with GraphDB, repository with ruleset OWL-RL)

**Part II:** Insights on ontological analysis

# What is a musical work?

This is **hotly debated** in, e.g., philosophy and musicology (see paper for references).

In different contexts, including common sense, people often classify, e.g., multiple scores as ***alternatives*** for the same work (≅ literary works in different editions)

But then:

- **What kind** of entity is a musical work? **Plethora** of opinions, e.g.,
  - **a.** Abstract Platonic entity
  - **b.** Mental entity in individuals' minds
  - **c.** etc.

# What is a musical work?

> “[W]ithin the tradition of what we call [...] Western art music, it has seemed axiomatic until quite recently that the basic unit of artistic production and consumption is the **‘work’** - a hard-edged artefact with a clear identity. [T]his common-sense or perhaps naive view is increasingly coming **under fire** from several sides.”
>
> Talbot, M. (2000). Introduction, in: The musical work: reality or invention? Liverpool University Press

Scholars of Renaissance music often confront rival versions of a musical text that strain our very notion of the **stable work** in the first place.

# What is a musical work?

Our intuition:

- From a library science perspective, a musical work is a **documentary entity** useful for classification purposes to support computational tasks, e.g., relative to data management
- **But then** … the classification of, e.g., multiple scores as alternatives for the same work is an **interpretative act**; e.g., experts sometimes disagree on how to classify a work and its arrangement(s)
- From this perspective, a musical work is a **cultural artifact** relative to specific interpreting communities

Wrt to OMAC:

- The cultural nature of (more generally) **musical entities** is not made explicit in the axiomatic structure since this would requires a heavier logical machinery (see Masolo et al (2021) quoted in the paper)

# Conclusions

Main result:

- OMAC - Semantic Web ontology in OWL - of music for musicology to express features of musical entities but also musicological claims

Future work includes:

- Further refine OMAC to grasp music experts knowledge
- Further test OMAC, in particular, wrt CRIM and other ongoing collaborations
- Implement the ontology in an application setting relative to CRIM; use of an **Ontology-Based Data Access** (OBDA) architecture based on OnTop to connect OMAC to the project relational database in such a way to make some portions of the project data available in RDF (**FAIR principles**)

# Thank you!

For further discussions,  you can reach us at: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