SIMSSA DB: Some details

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Review of SIMSSA DB highlights

- Prototype database of symbolic music designed to meet the specific needs of scholars engaging in large-scale computational musicological research
  - Emphasis on tailoring the interface to meet needs of musicologists
- Feature-based search combined with free-text and faceted metadata search
  - Full sets of auto-extracted jSymbolic feature values can also be downloaded
- Emphasis on research-relevant data structuring
  - Modeling of complex abstract musical relationships
    - e.g., relationships between sources and (abstract) works, sections and parts
    - e.g., linking different kinds of musical objects
  - Provenance chains
  - Archiving of specific corpora and features associated with specific studies
  - Authority control and cataloguing standards

Data quality

- Focus on high-quality data
- Quality of individual documents is especially important in early music:
  - Individual details very important to domain experts
    - e.g. a single cadence or even a single note
  - Few extant sources, so limited training/testing data will ever be available and there is limited room for statistical noise
- Problem: Ensuring high-quality structured data requires expertise and effort on the part of contributors and validators
  - One of the reasons the SIMSSA DB is designed primarily for use by musicologists and, to a lesser extent, MIR researchers
  - A quantity vs. quality tension, which will inform ongoing development
    - Both in the amount of data and in the amount of structuring and annotation

Abstract works, sections and parts (1/2)

- The SIMSSA DB maintains a conceptual separation between abstract musical works and particular instantiations of them (as expressed by particular symbolic files, for example)
- Multiple versions of the same abstract work can exist, and these should be both associated with and differentiated from one another
    - e.g. different editions, arrangements, etc. of a work
    - e.g. different digital symbolic encodings of the same manuscript

Abstract works, sections and parts (2/2)

- The SIMSSA DB makes it possible to divide music into abstract Works, Sections and Parts
  - Symbolic files sometimes contain whole pieces, and sometimes only subsets of pieces
- The makes it possible to keep track of complex abstract relationships
  - e.g., a single movement of a mass might be reused in another mass
  - e.g., an orchestral score and a keyboard reduction of it have different parts, but they are also different versions of the same abstract work

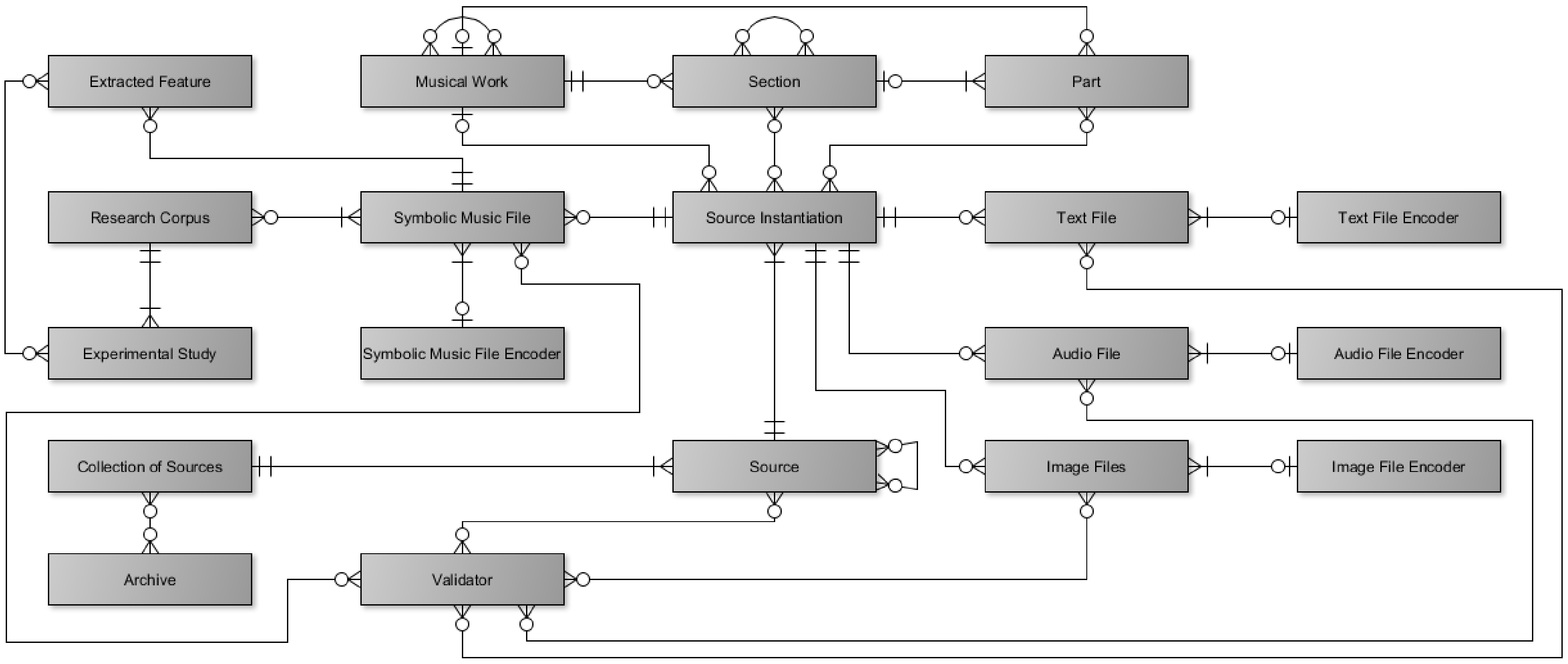
Sources and provenance

- Keeping a record of provenance is musicologically essential
- Each digital object in the SIMSSA DB (e.g., a symbolic music file) is therefore linked to a Source
    - A “source” is a reference (including, ideally, a URI) to a physical or digital document from which a digital object in the SIMSSA DB (e.g., a Music XML file) was derived
- Each source can in turn be linked to its parent source(s) through (eventually) chains of provenance
    - e.g., a symbolic MEI file transcribed from a printed score, derived from a hand-written copyist’s manuscript, derived from a hand-written original manuscript in the composer’s hand

Source Instantiation elements

- Source Instantiation entities link each digital object / Source pair to:
  - Each other *(required)*
  - Abstract Works, Sections and Parts *(optional)*
  - Other digital objects stored in the SIMSSA DB *(optional)*
- A Source Instantiation can encapsulate all of a source or only part of it
  - e.g. an entire score or a single page of a book
- Source Instantiation entities are not exposed to users

Overview ERD of the SIMSSA DB data model



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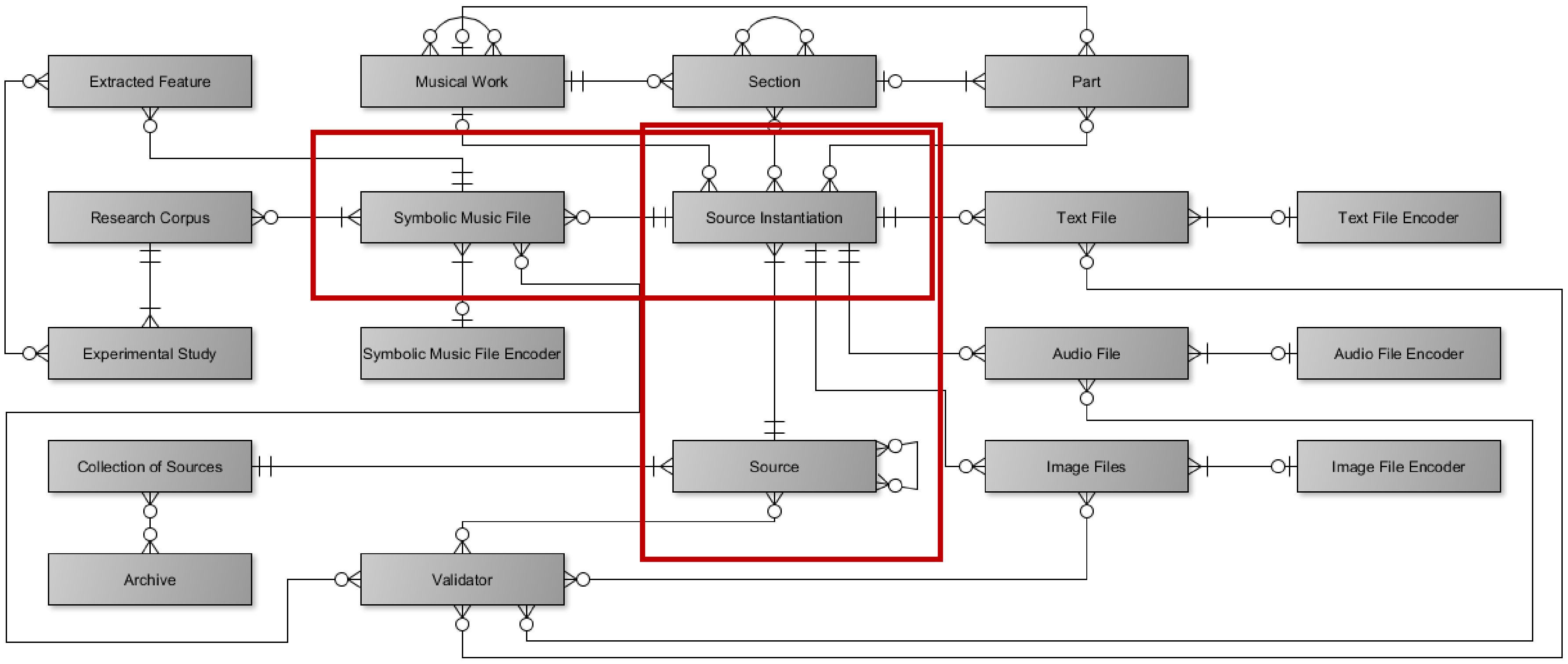

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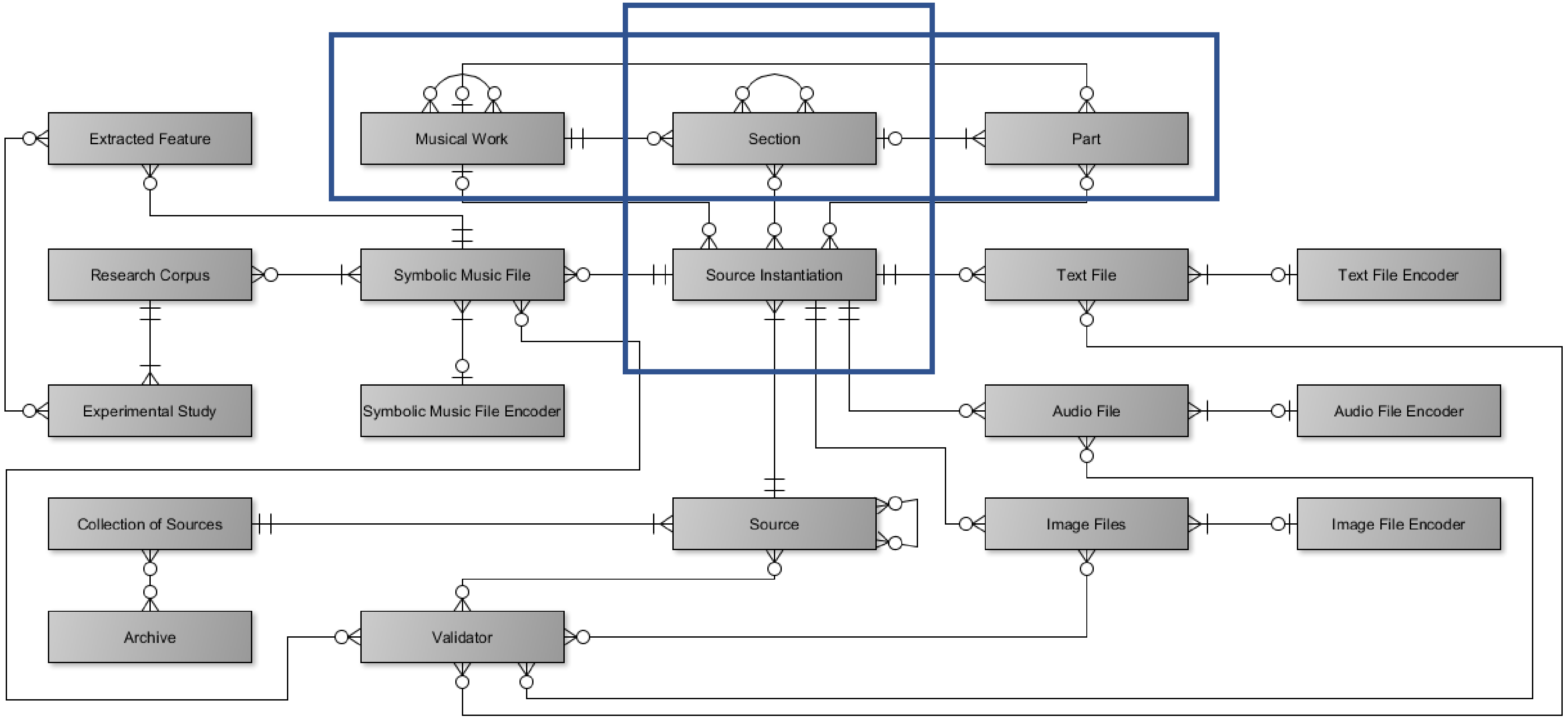

Other kinds of digital objects

- The data model is designed to ultimately permit structured access not just to symbolic music files and features extracted from them, but also to related files containing:
    - Images
    - Audio
    - Text
- Useful for expanding the scope of the SIMSSA DB
    - Particular focus on facilitating integration with frameworks for generating (validated) symbolic music via OMR
- These are all connected to each other and to sources using Source Instantiation entities

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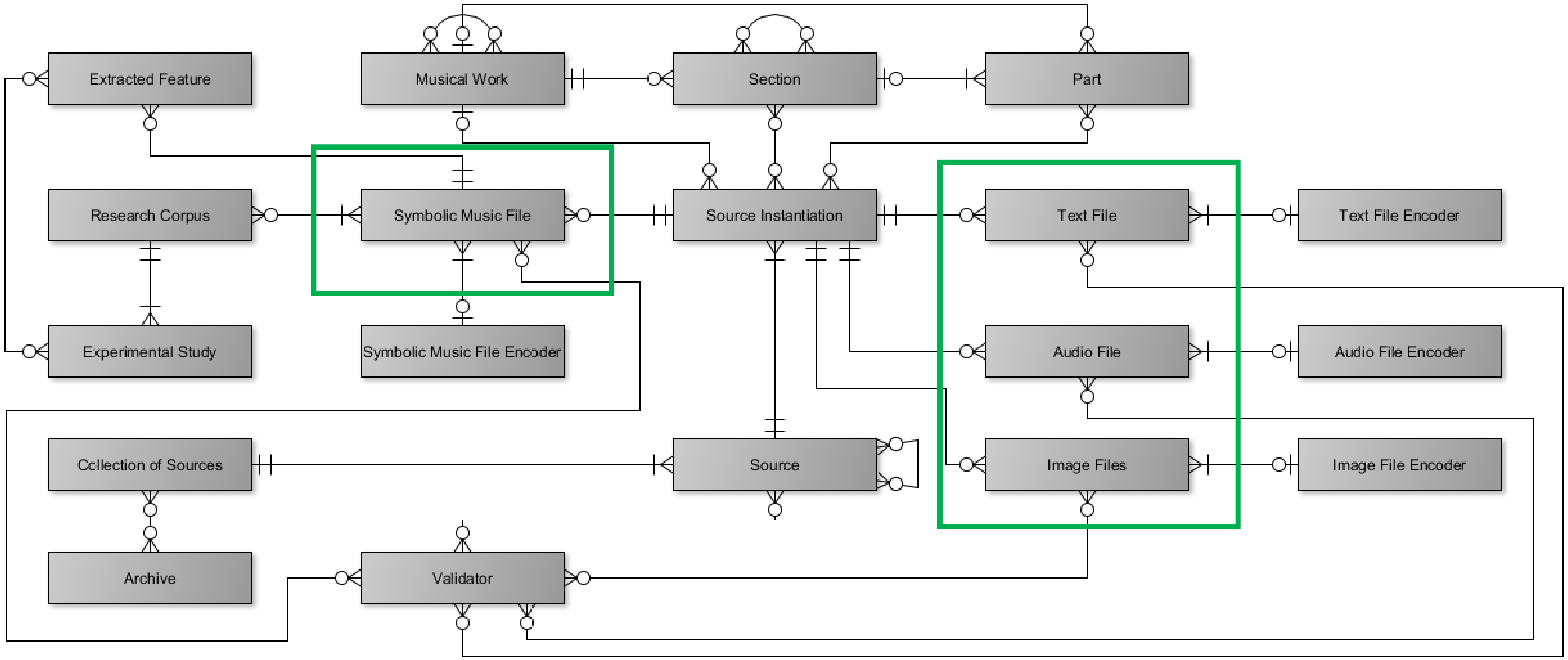

Archiving specific research datasets

- In scientific music research, facilitating repeatability of research and iterative refinements is essential
- Specific datasets used in specific studies can be archived on open research repositories, such as Zenodo
  - These can then be linked to directly from the SIMSSA DB
  - The SIMSSA DB can also internally represent a specific Research Corpus of collected symbolic music files and features that were used in a specific Experimental Study
- Other scholars can then access the precise symbolic music files and feature values used in a given study
  - Access to such snapshots are important because the both encoding details and feature implementations matter and can change

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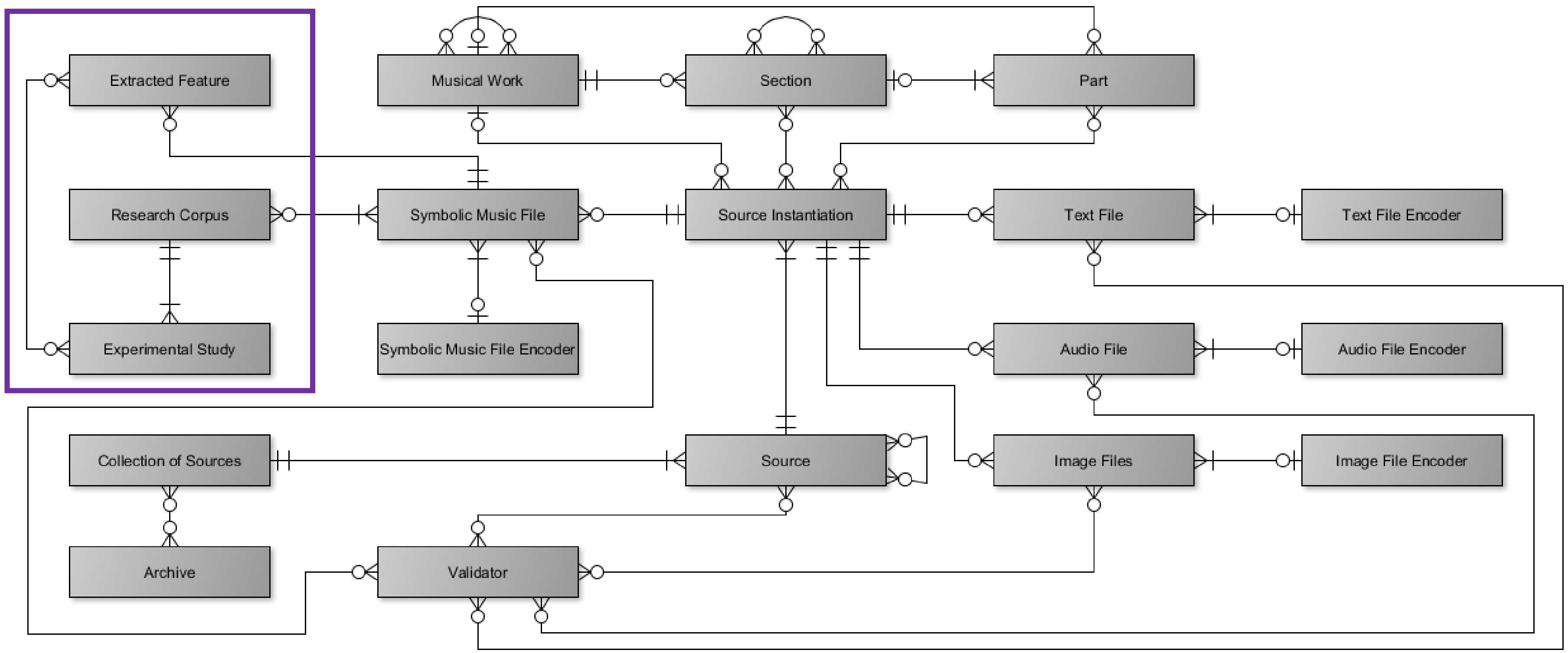

Quality control and quality control provenance

- Encoder objects keep track of who (or what) generated digital objects stored on SIMSSA DB
- Validator objects keep track of who validated / verified digital objects and metadata about them
    - And sources!

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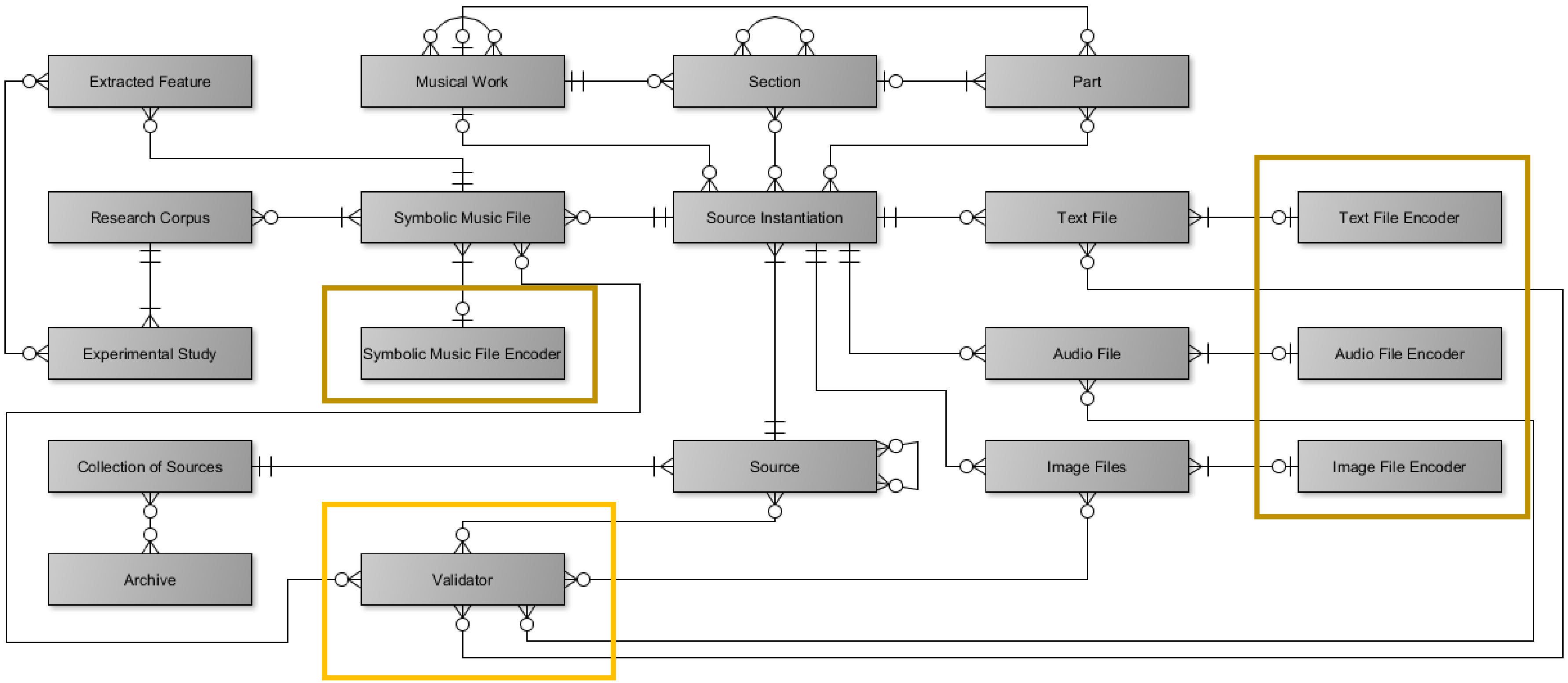

Authority control

- Should be able to automatically match differing but equivalent metadata
  - e.g. “Stravinsky” and “Stravinski”
  - e.g. “Le Sacre du printemps” and “The Rite of Spring”
- The SIMSSA DB uses authority control and cataloguing standards to reduce ambiguity and redundancy (and increase consistency) as much as possible
  - Currently uses VIAF authority files
  - Populates fields with URIs and uses linked open data practices when possible
- Metadata tags are auto-suggested as users type based on these authority files when they submit contributions
  - e.g. composer name, genre name, etc.

Medium term goals

- User studies with musicologists to improve the web interface
- Expand the feature set to include the upcoming jSymbolic 3 features
  - Including n-gram features
- Use features in more sophisticated ways, such as:
  - Metadata auto-tagging using AI-based predictions (with manual verification)
    - e.g., modes found in a piece
    - These could then be used in queries
  - Feature-based similarity measurements
    - e.g., tracking musical influences of composers or individual pieces
    - e.g., search by similarity (like Google image reverse searches)
  - Exploratory research using unsupervised clustering

Long-term goals

- Store the product of (verified) optical music recognition (OMR)
  - And associated multimodal data linked to symbolic music files, like images of manuscripts, text extracted from them, etc.
- Formalize editorial and encoding practices
  - e.g. music ficta, rhythmic note values, etc. in early music
  - We have already done some initial work in this direction (Cumming, McKay, Stuchbery and Fujinaga 2018)
- Allow local melodic and harmonic queries
  - In addition to the global feature-based queries SIMSSA DB already has

Live demo

- Not all functionality is enabled in the test version that is currently live
    - e.g., upload is disabled in this version
- https://db.simssa.ca

Feedback please

- We would be very grateful for any ideas, wants or needs you may have:
  - How can SIMSSA DB in general be integrated with your own systems and research?
  - More generally, how might feature-based data or queries be integrated into your own systems or research?
  - Is there anything you would especially like the SIMSSA DB to be able to do?

Thanks for your attention!

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